THE JOURNAL OF THE DEPARTMENT OF AGRICULTURE
WESTERN AUSTRALIA

VOL. 2 (Fourth Series) JANUARY, 1961 No. 1

Issued by direction of the Minister for Agriculture, and published monthly by the Department of Agriculture, Perth, Western Australia.

Annual Subscription Rates (inclusive of postage) are:—
Australia and New Zealand .... 20s.
Other British Commonwealth Countries .... 23s.
Foreign Countries 29s.
Single copies, 2s. each.

Articles which appear in the Journal may be reprinted, provided that both the Journal and the authors are acknowledged.

COVER PICTURE
A crop of beans in the Spearwood area being sprayed

In this Issue

	Page
The New Director	5
Water Conservation on the Farm .... J. Lewis	7
Silage Competition, 1959-1960 .... H. G. Elliott	19
Fertiliser Trials with Potatoes, Manjimup, 1958-59 T. Wachtel	25
Farm and Home—Preserving and Pickling .... O. Evans	29
Local Control of Crows by Trapping .... C. J. Woodbury	33
Bluebush Seed, Cleaning, Drying and Storing .... C. V. Malcolm	37
Sclerotinia Root of Vegetables .... S. E. Chambers and M. Hardie	41
The Dehorning of Cattle .... J. Shilkin	45
List of Registered Fertilisers .... H. G. Cariss	51
Virus Pneumonia of Pigs .... J. Craig and N. MacIntyre	65
Honey Flora Calendar for February....	72
The Housefly .... C. F. H. Jenkins	75
Lets Look at Dairying .... M. Cullity	83
Light Brown Apple Moth .... C. F. H. Jenkins	85
The Use of Seaweed as a Fertiliser .... T. Wachtel	86
Trees of Western Australia—The many flowered Mallee, Yate, Grey Gum and *Eucalyptus albida* C. A. Gardner	89

By Authority: ALEX. B. DAVIES, Government Printer

42183/12/60—17,300

DEPARTMENT OF AGRICULTURE

OF

WESTERN AUSTRALIA

Minister for Agriculture:
THE HON. C. D. NALDER, M.L.A.

Director of Agriculture:
T. C. DUNNE.

Chief Administrative Officer:
W. HOPKINSON.

ABATTOIRS

Controller.—T. C. ROWLANDS.

ANIMAL DIVISION

Chief Veterinary Surgeon and Chief Inspector of Stock.—C. R. TOOP.

Assistant Chief Veterinary Surgeon.—J. SHILKIN.

Animal Nutrition Officer.—L. C. SNOOK.

ANIMAL HEALTH LABORATORIES

Chief Veterinary Pathologist.—M. R. GARDINER.

POULTRY

Officer-in-Charge.—R. H. MORRIS.

BRANDS

Registrar of Brands.—C. R. TOOP.

HORTICULTURAL DIVISION

Superintendent.—H. R. POWELL.

Assistant Superintendent.—J. P. ECKERSLEY.

FRUIT

Senior Adviser.—F. MELVILLE.

Viticulturist.—W. R. JAMIESON.

VEGETABLES

Senior Adviser.—J. P. FALLON.

TOBACCO

Adviser.—A. E. BAKER.

APICULTURE

Officer-in-Charge—R. S. COLEMAN.

DAIRYING DIVISION

Superintendent.—M. CULLITY.

Assistant Superintendent.—H. G. ELLIOTT.

Agrostologist.—F. E. RYAN.

Officer-in-Charge, Dairy Factory and Produce Supervision.—K. NEEDHAM.

WHEAT AND SHEEP DIVISION

Superintendent.—F. L. SHIER.

Assistant Superintendent.—A. S. WILD.

Senior Adviser Meat Production.—N. DAVENPORT.

SHEEP AND WOOL

Officer-in-Charge.—W. L. McGARRY.

SOILS DIVISION

Superintendent and Commissioner of Soil Conservation.—L. C. LIGHTFOOT.

Senior Soil Research Officer.—S. T. SMITH.

IRRIGATION

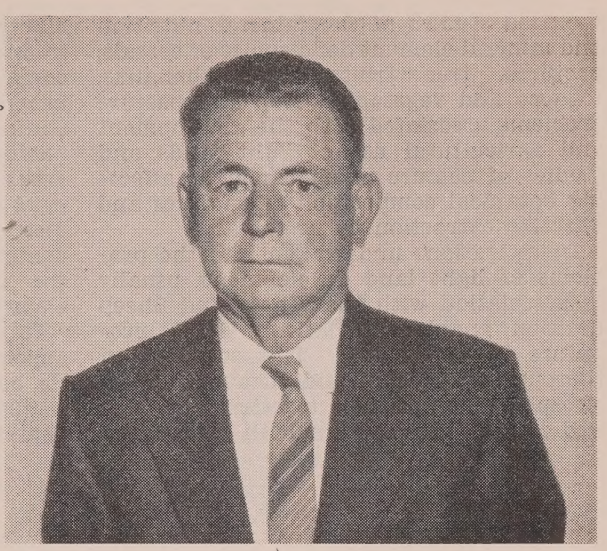
Officer-in-Charge.—H. J. K. GIBSONE.

PLANT RESEARCH DIVISION

Superintendent.—G. H. BURVILL.

Senior Plant Research Officer.—L. T. JONES.

The New Director



The new Director, Dr. T. C. Dunne, was born in Fremantle where he received his primary and secondary education. After winning a Government exhibition and the Henry Seeligson scholarship at the age of 16, he enrolled in the faculty of Agriculture in the University. He gained the degree of B.Sc. (Agric.) in 1925 and was awarded the Amy Saw scholarship for post graduate study. During 1926 he worked in the Wheat Branch of the Department of Agriculture until his departure for the U.S.A. at the end of that year.

He entered the University of California and commenced post graduate studies in plant physiology, plant nutrition and plant pathology. He was awarded a Hacket scholarship in the same year. After four years at California during the course of which his studies and research work gained him the degree of M.S. and Ph.D., Dr. Dunne spent four months at the plant breeding station in the University of Wales, which was then the leading institution in the world for pasture research.

On his return to Western Australia in 1931 Dr. Dunne was appointed Government Agrostologist and was seconded to work under the Merchants' Agricultural Research Fund with headquarters at Muresk Agricultural College. This appointment marked the commencement of his long and continuing association with Western Australian farming problems. In the six years at Muresk he was engaged on pasture work in the wheat and sheep areas, and in the south-west and southern dairying districts. During that period he was the author of numerous papers one of which, written in 1934 in collaboration with F. L. Shier, entitled "A Modified Rotation for the Wheat Belt," was the first recommendation in Australia for the practices which are now known as "ley" farming and which are the basis of a permanent agriculture involving cropping.

From 1937-1947 Dr. Dunne carried out research in the Horticultural Branch of the Department. His investigations were concerned with the mineral nutrition of fruit trees and vines, the pollination and setting of grapes and storage disorders of various fruits.

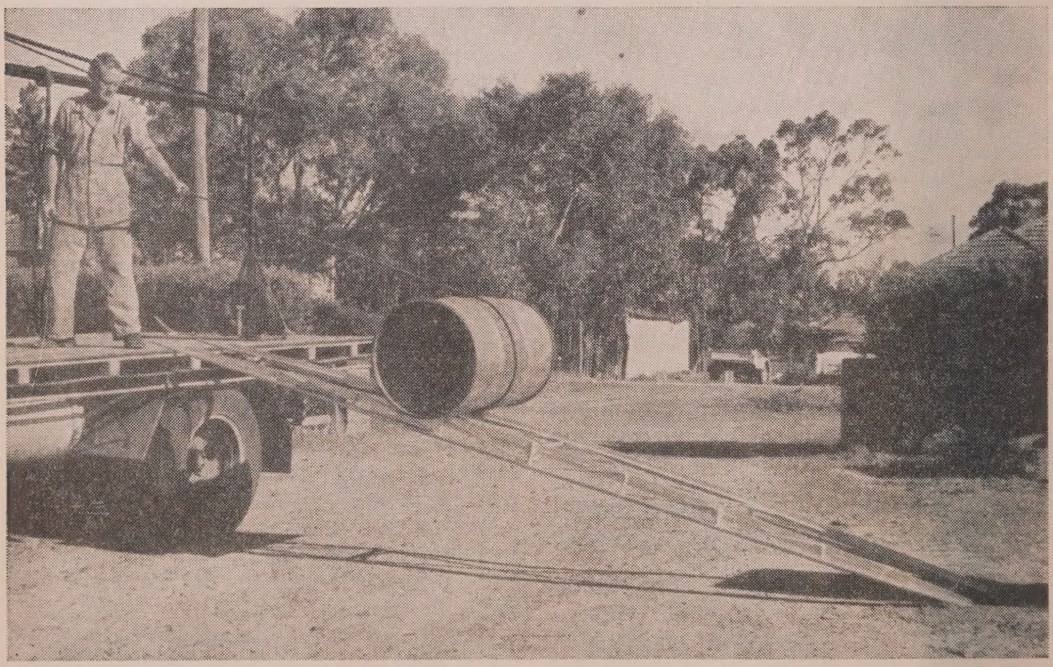
During the war he acted as honorary technologist for dehydration and canning and as executive officer of the Vegetable Seeds Protection Committee.

In 1947 Dr. Dunne was appointed Chief Plant Research Officer in the Department of Agriculture in charge of the Plant Research Branch. The work of the branch

included studies of the mineral nutrition and mineral element deficiencies of cereals, pastures, tree fruits, vines, bananas, tobacco and vegetables, crop and pasture problems associated with the development and agricultural use of light lands and studies of pasture management as affecting botanical composition of pastures and effective extraction by animals.

Investigations undertaken into the problems of light land development, usually in association with the Wheat and Sheep Division, enabled a relatively simple procedure to be evolved. This consisted of thorough cultivation and adequate superphosphate applications together with zinc and copper fertilisers for both cereals and clover. Methods for establishing pastures in higher rainfall areas less suitable for cereals were investigated. As part of that programme the Esperance Plains research station was established. On established pastures in the south-west and southern areas spectacular increases in production were obtained by proving that growth was restricted by deficiencies of zinc, molybdenum or potassium and by recommending the use of fertilisers containing those elements.

In January, 1956, Dr. Dunne was appointed Deputy Director of Agriculture. He became Acting Director on September 5. 1960, and was appointed Director on September 21, 1960.



A loading ramp with which beekeepers with the electric winches and boom loaders lift their drums of honey on to their trucks. Western Australia leads the rest of the Commonwealth in using 44 gallon drums to handle their honey crop. With the saving in tins, the drums pay for themselves on their second trip to the honey packer.

WATER CONSERVATION

On The Farm

By JOHN LEWIS, B.Sc., (Agric.)
IRRIGATION ADVISER

SMALL scale conservation of water for agricultural use is becoming increasingly important throughout Australia. As land development intensifies, it is natural that farmers turn to more dams and earthen tanks for stock water and irrigation. Adequate water is essential to supply the carrying capacities made possible by improved pastures, and where greater quantities of water can be stored, fodder crops, pastures, orchards and vegetables can be irrigated.

Prime factors in the development of farm water conservation since 1945 have been the advent of high-powered earth-moving machinery, and portable aluminium irrigation equipment. These have altered the whole outlook on irrigation, for it means that water can be caught and stored where it falls, and used at a later time.

Water stored in large dams built by the Government is limited by finance and suitable rivers. This applies particularly to our State, where there are few rivers that can be dammed. There are few properties, however, that lack some situation where water can be stored. Water is our most valuable mineral, and the main hope for future water conservation for agriculture is on the farm.

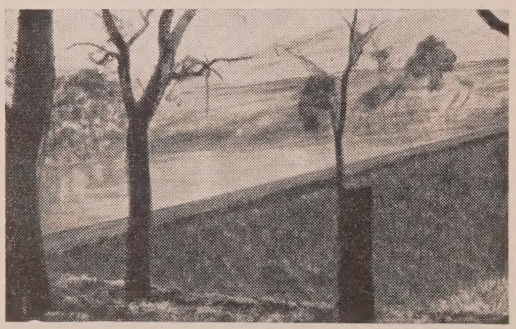
THREE TYPES OF EARTH STRUCTURE

Most earth structures for storing water fall into three main groups.

1. **The Simple Excavated Tank.**—In this type of construction all or most of the water is stored below ground level. Where the tank is on sloping land, some water will be stored above ground level by a bank, and attention must be paid to the catchment area on higher land in order to fill it.

Seepage is often an important source of water supply for this type, especially on flatter ground.

2. **A Dam Across a Gully.**—Such a dam impounds the water of a stream, whether permanent or semi-permanent. The wall is usually made of earth, with an impervious clay core or blanket. Concrete is considered out of the question, except perhaps for a small weir, as the cost would be 11-14 times that of the earth wall.



This dam, situated at Donnybrook, has a capacity of 80 million gallons making it one of the largest privately owned dams in the State

3. **The Turkey-nest Dam and Ring-dam.***—These dams consist of a completely enclosed embankment, and require fairly flat ground and good clay close to the surface. They may be filled by pumping or fluming water from a nearby source, such as a stream. The main difference between them is that the turkey-nest dam

* These are other forms of earthen tanks

stores all its water above ground, being constructed from borrow-pits nearby, thus enabling all the water to be gravitated to stock-troughs.

With the ring-dam, all the material for the wall is taken from inside the dam, from as near the wall as possible. The centre is usually left intact, as it would cost too much to remove, for the main advantage of this type of construction is its cheapness.

Part of the water is stored above ground, and part below, and must be removed by pumping.

Before discussing these various types of dam in more detail, it may be as well to examine the cost involved and the different uses to which they are put; in other words, what determines the type and size of dam to be built.

REQUIREMENTS

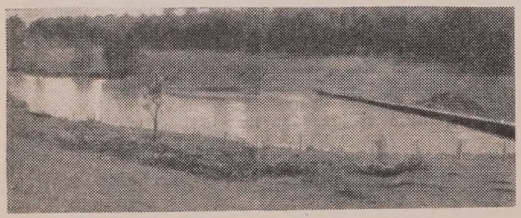
The following figures give a guide to water requirements for different purposes.

(1) **Stock and Domestic.**

Sheep—2 gallons per day.
Pigs—3 gallons per day.
Horses, cattle—10 gallons per day (double for dairy cattle).
Household—50 gallons per day.
Garden—Variable, say 500 gallons per day per ¼ acre.

(2) **Irrigation.**

Potatoes—1 million gallons will irrigate 10 acres, per season.
Orchard—1 million gallons will irrigate 5 acres, per season.
Pasture, lucerne—1 million gallons will irrigate 2 acres, per season.



Apart from the practical value, settings such as this add to the attractiveness of a property

It must be borne in mind that these figures are only intended to give an indication of water storage needed, and will vary with the weather, soil type, and type of irrigation used. When calculating irrigation requirements, remember to add on losses from evaporation and seepage.

Permanent pasture and sudan grass are sprinkler irrigated from this 14 million gallon dam at Boyup Brook

COSTS

The question of costs is all-important, and can mean the difference between profit and loss. In considering water storage structures, the storage-excavation ratio gives a useful guide. This is the ratio of the volume of water stored to the volume of earth removed.

For example, an excavated tank would have a ratio of 1 : 1. Gully dams are variable, depending on the shape of the gully and its gradient, and may be 2 : 1, 6 : 1 and higher. The average would be about 3 : 1. Ring dams have the highest ratios, and therefore the cheapest water. Ratios of 6 : 1 are common.

The following figures from 4 dams in the South-West give some idea of the variability of this ratio, and how it affects costs.

Dam	Capacity	S : E Ratio	Cost
	Million Gallons		Per Million Gallons
1	80	17 : 1	£50
2	3½	6½ : 1	£91
3	8½	4½ : 1	£170
4	7	2 : 1	£286
Adaminaby	1,050,000	655 : 1	£15

The figures for Adaminaby show what can be achieved with a very large earth dam.

The four farm dams are all economically sound, so it can be seen that too much importance must not be attached to the S : E ratio. It is simply a guide, and it is important to examine what sites there are avaliable on a property, and assess their soundness individually.

A few months before the dam was built on this property this artificial lake was a dry gully

Another way of looking at the cost factor is on an annual basis. Assuming contracting charges are 2s. per cubic yard (some contractors charge 2s. 6d.), the life of the structure is 40 years, and replenishment take place once a year, the annual cost of water would be—

S : E Ratio	Annual Cost of Water (per million gallons)
3 : 1	£17
5 : 1	£13
7 : 1	£11
10 : 1	£9½

It can be seen that the farmer must look further than the capital cost of the structure when considering water conservation.

Construction costs can be influenced greatly by the type of machine used and the methods used. This may not matter to the farmer if payment is made by the hour. Usually it is best to get a firm quote for the whole job before work commences, because there is more in building a dam than shifting earth, as will be explained later.

EXCAVATED TANK

When selecting a site for a tank, it is important to have a satisfactory subsoil. Borings should be carried out with an auger, to a depth of 2 ft. greater than the depth of the tank.

Where the tank is to be filled by runoff, a study of the catchment area before final siting is vital. To this end it often helps to walk over the land during rain, to observe the direction of runoff. The amount of runoff can vary greatly, and depends on the type of vegetation, soil type, slope of land, and intensity of rainfall. A very approximate value would be 10-20 per cent. of the annual precipitation. The effective catchment area can be increased considerably by running graded drains to the tank, with a fall of 1½ in.-2 in. per chain. These drains collect water, which may otherwise flow in another direction, and direct it into the tank.

Other points to watch when siting a tank are to keep it out of the centre of large watercourses, keep it out of line of the prevailing winds if possible, to reduce evaporation, and make sure it is accessible to all stock.

When construction is under way, it is always best to aim for the deepest depth possible for the size of the tank, to reduce evaporation losses. When construction is finished, a grassed bypass is a good safety feature, for, although tanks do not usually overflow to any great extent, an occasional very wet winter may damage the wall. To protect the wall it is sound practice to establish grasses on the bank, and fence it from stock, piping the water to troughs.

An exceptionally large (7 million gallon) excavated tank at Donnybrook

GULLY DAM

This type of dam impounds the water of a stream, and therefore requires care in siting and construction. There is more

to building a dam than just scraping up a wall with a bulldozer, as many have found to their sorrow.

Choosing a Site.

Several aspects must be considered when choosing a site. Dams are usually used for irrigation, so to reduce piping and pumping costs it it important to have the dam situated as near as possible to land which is to be irrigated. It is a good idea to take advantage of any natural features which may exist, e.g., a basin shape or widening of the gully, to increase the storage capacity. Narrow, V-shaped gullies are usually poor sites, especially if the gradient is steep.

A survey of the whole site is usually essential, in order to calculate the holding capacity, and volume of material required for the wall. Borings should be made with an auger right into the underlying clay, as there are often porous seams in a stream bed. If rock underlies the site it is wisest to abandon the position, for although a dam can sometimes be built on rock, the danger of seepage along the clay-rock interface and perhaps the collapse of the whole structure is ever present.

Many kinds of wild life have made this 6 million gallon dam at Boyup Brook their home

Catchment.

For a gully-type dam the catchment area needs to be correspondingly large. Areas up to 100 to 300 acres are easily handled, but larger areas present difficulties of water disposal. Where the winter flow is small, and a large dam is to be filled, it may be as well to gauge the flow of water. A quick way of doing this is to select a section of the stream where the cross-section is uniform, measure the width and depth and observe the time taken for a light object such as cork to float a measured distance. The rate of flow can be calculated from the fact that 1 cubic foot per second is equal to 375 gallons per minute, or an acre inch (22,687 gallons) per hour.

Potatoes being sprinkler-irrigated at Brookhampton. The dam can be seen in the centre

A second, more accurate method involves the use of a 90° V-notch board placed at right-angles to the stream. The rate of flow can be obtained by measuring the depth of water at the V-notch and consulting Table 1. The depth of water must be obtained from a peg a few feet back from the V-notch board, with the top on the same level as the bottom of the V-notch.

TABLE 1
Table of flow through 90° V-Notch

Depth of Flow in Inches	Discharge	
	Gallons per Hour	Gallons 24 Hours
¼	20	482
½	55·6	1,335
1	114·2	2,741
1¼	199·4	4,785
1½	314·7	7,552
1¾	462·6	11,100
2	646·0	15,500
2¼	867·1	20,810
2½	1,128·5	27,080
2¾	1,432·1	34,370
3	1,780	42,720
3¼	2,174	52,190
3½	2,617	62,810
3¾	3,110	74,630
4	3,654	87,700
4¼	4,252	102,050
4½	4,905	117,730
4¾	5,615	134,770
5	6,384	153,210
5¼	8,101	194,430
6	10,070	241,670
7	14,804	355,300
8	20,671	496,100

1 Acre foot = 272,250 gallons.

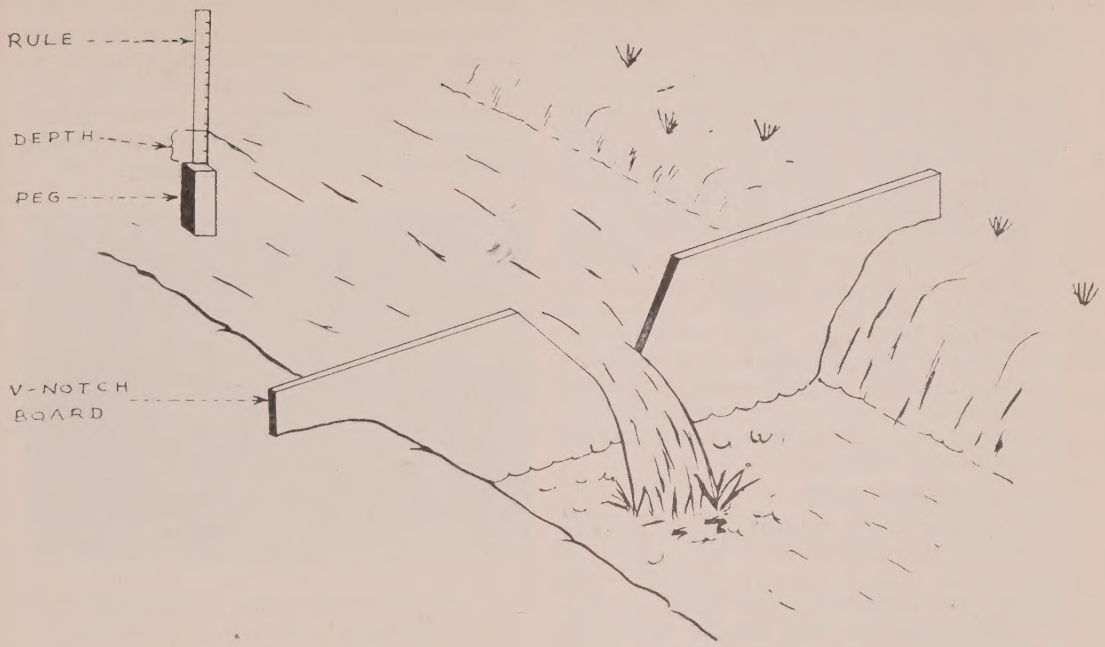


Fig. 1.—90° V Notch Weir.

Other factors to bear in mind are the legal and moral aspects of damming a watercourse. Some landowners have what is known as Riparian rights, and their normal supply of water must not be diminished by interference from above. Of course, this only applies to a permanent stream, and a dam on such a stream should only store winter water, and let the summer flow continue undiminished. Another point to remember is the legal liability of a dam-owner for damage to property if his dam fails.

Construction.

Construction is commenced by first removing the vegetation, and then stripping the topsoil from the site and stockpiling it on the downstream side of the damsite. In the core method, a key is cut into the clay subsoil, and a clay core built up with batters of approximately 1½ : 1 (see figure 2). Finally the outside batters are built up using mainly topsoil, and these have a slope of 3 : 1 on the upstream face and 2 : 1 on downstream face. These batters may be reduced in some circumstances if the material is first class.

It is very important that the material be adequately compacted when building the wall, and to this end the clay should be placed in layers not greater than six inches thick and rolled. A sheepsfoot roller is best for this, a pneumatic-tyred roller is good, but a bulldozer, because the weight is spread over a large area of track, has only a small compacting effect. The clay and soil must also be at the right moisture content for adequate compaction.

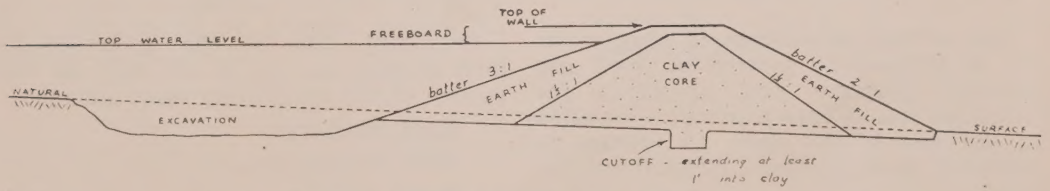


Fig. 2.—Typical Section of Dam Wall showing Clay-core Method of Construction.

The material should be as uniform as possible, not dry or wet, or different clays, otherwise stresses may be set up within the wall. This question of consolidation cannot be emphasised too much. It is one of the most important factors in good dam construction, and its neglect is the cause of sinking, and longitudinal cracking, which lead to most dam failures.

The other principal method of construction is the blanket method. Here a blanket of clay is placed on the wall to form an impervious barrier to water, and is used where the bank and the gully sides are porous, or where suitable clay is scarce.

When the wall is finished, it is a good policy, as with the tank, to grass and fence the bank. Grassing stabilises the structure and prevents erosion.

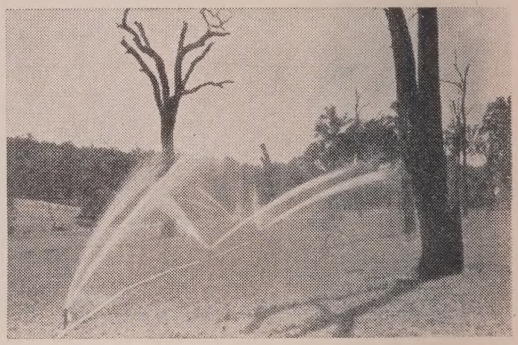
Pipe Under the Wall.

There are many advantages in putting a pipe in the bottom of a wall, and it is quite safe, if it is put in properly. The pipe is laid during the early stages of construction, and the clay should be firmly tamped down around it. Several anti-seep collars assist in anchoring the pipeline and eliminating seepage, and should be of such a size that the length of the path of any seepage is increased by 20 per cent., e.g., if the pipeline is 100 ft. long, then five collars, each two feet in radius are required. The diameter of the pipe naturally varies with requirements, but six inch diameter is usually sufficient for the average farm dam.

The outlet valve should be as low as is convenient and the pipeline level, in order to draw off as much water as possible.

Another important advantage is the cleaning effect a pipe has when left open during the early part of the winter, as silt and brackish water are removed.

Finally it provides an extra safety margin to the overflow, and water can be released downstream if necessary.



Sprinkler-irrigated millet at Bridgetown

Bank Dimensions.

Batters.—Usually 3 : 1 and 2 : 1, but may be reduced under some circumstances.

Crest Width.—Depends on the height of the wall, and is determined by the formula:

$$W = \frac{H}{5} + 5 \quad \text{where } W = \text{width}, \ H = \text{height}$$

Hence for a wall 15 ft. high, width = 8 ft.

However, the top of the wall frequently is used as a road, so is made wider, e.g., 12 ft.

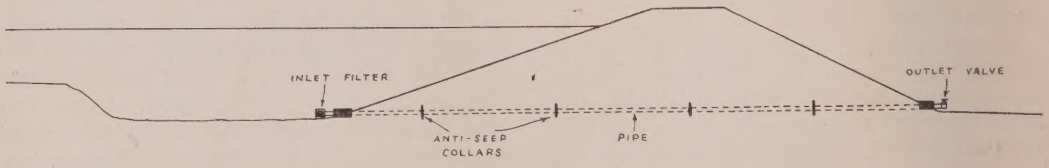


Fig. 3.—Typical Section of Dam Wall showing Pipe and Attachments.

One of the advantages is that water can be supplied by gravity for stock and domestic purposes and sometimes for irrigation too. Where a pump is installed at the foot of the dam, no priming is necessary, as it is under a negative suction head.

Freeboard.—This is the difference in level between the top of the wall and the bottom of the bypass, and must include:

flood surcharge,
wave action,
safety margin.

This figure is usually 3 ft. for walls up to 15 ft. high, and greater for higher walls.

It must be remembered that the best of walls sink a little, and 10 per cent. must be allowed for subsidence. To counteract this, it is a good idea to finish off the wall higher in the centre than at the ends.

Two bulldozers are being used to construct this dam

Bypass.

The size of the bypass depends on the nature and extent of the catchment, and the rainfall intensity. A very approximate value can be obtained from the formula:

$W = K\sqrt{A}$ where W = width
A = area of catchment.
K = 5 for high rainfall areas.
4 for inland areas.

The bypass is the most important part of the dam, and may account for a large proportion of the total cost.

It is best cut in untouched ground around the end of the dam, and given a slight fall for 2 chains before returning to the gully. This is to make sure there is no danger of the water cutting back and eroding the wall. The problem of erosion is encountered when the overflow water is returned to the gully down a steep slope. Depending on the amount of flow, this should be grassed, stoned, or, best of all, concreted.

Causes of Failure.

Most dams fail due to overtopping, and the force of the water rapidly scours away the wall. The cause of overtopping may be insufficient freeboard, too small a bypass, or wall subsidence due to poor consolidation or unsuitable material.

Seepage underneath a dam will progressively weaken a wall, and may lead to collapse.

RING TANKS

The true ring tank is constructed entirely from material within the tank, thereby increasing the holding capacity. Although this means that some water is stored below ground in the excavation, much of it is stored above ground level. The centre area is left untouched to give maximum economy of construction, and, as would be expected, the S : E ratio is fairly high.

A big disadvantage of the ring tank is the large area of water at comparatively shallow depth, resulting in high evaporation losses. These losses can be reduced, as described later, but it must be realised that they are a result of the cheap construction methods.

The ring tank is the logical choice for irrigation where the country is flat, for to store sufficient water in an excavated tank would cost too much. Many farmers ask why the centre is left untouched but, if it is removed, the tank becomes, in effect, an excavated tank, and costs more.

Another disadvantage of the ring tank is the necessity to fill by pumping. The axial flow pump is ideal for this purpose, as it has a high efficiency at low heads.

To take full advantage of this type of construction, good clay close to the surface and an adjacent water supply are needed. Any natural depressions also help reduce the cost of storage.

Dimensions are as follows:—
Batters $2\frac{1}{2}$: 1 and 2 : 1.
Freeboard 2 ft.

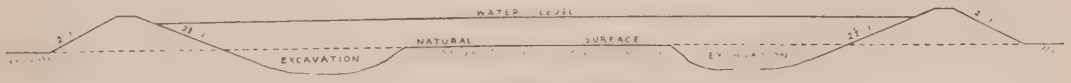


Fig. 4.—Typical Section of Ring Dam.

EVAPORATION LOSSES

Losses from a body of water due to evaporation can be very high, especially in the inland areas of Australia, when it is 10 ft. or more per annum. In the South-West it is about 3 ft. per annum.

Evaporation can be reduced considerably by the Mansfield process, which spreads a very thin film of hexadecanol on the surface of the water. Naturally the cost of the water saved varies with the evaporation rate, and the following figures quoted by the C.S.I.R.O. show this variation.

Annual Evaporation Rate—Feet	Annual Saving Acre/Ft.	Cost/1,000 gallons Saved—pence
2	0·5	16
5	1·25	6½
10	2·5	3

Hence in the South-West region, the cost of each 1,000 gallons saved would be about 1s., which is very high. The cost of reducing evaporation must be related back to cost of storing water, and except where the evaporation is very high, it is better to put the money into more storage.

Flood-irrigated permanent pasture at Donnybrook

SEALING LEAKING DAMS (EARTHERN TANKS)

Next to evaporation, seepage is the cause of the major loss of water from dams. It is virtually money down the drain, but can be reduced in several ways.

(1) Impermeable Clay.

If the clay in the dam is suspect, tight impermeable clay from another source can be carted in and placed in a layer against the face of the dam. It should be consolidated, preferably with a sheeps-foot roller, or a mob of sheep.

A well-graded bypass. The water has a low velocity and does not erode

(2) Common Salt.

Where only a section of the dam is leaking, mixing common salt with the surface clay makes it impermeable, due to the deflocculating action of the Na ions on the clay colloids. However, the use of salt must be strictly limited because it makes the water salty, e.g., adding 1 lb. salt to 100 gallons water increases the salt content by 70 grains per gallon.

(3) Sodium Tripolyphosphate.

This also acts through increasing the Na ion content of the exchange complex, causing the clay to become less permeable. It is mixed with the surface 6 inches of soil at the rate of 1 ton per acre. At a cost of £160 per ton, the cost of treating a 1,500 yard tank would be about £20.

(4) Bentonite.

This is a type of clay imported from the U.S.A., and has the property of swelling to many times its size when wetted. It is mixed with the surface soil at the rate of 20 tons per acre, and when wetted, effectively seals the permeable clay. At a cost of £35 per ton, the cost of treating a 1,500 yard tank would be £70-80.

(5) SS—13.

This is a new method developed in the U.S.A. and consists of a solution of chemi-

cals in a diesel fuel base. It is mixed with water of a dam, and alters the exchange complex chemistry of the soil. It is not obtainable in Australia at present, but would be very expensive if it were imported—the cost of treating a 1,500 yard dam would be at least £250.

(6) **Plastic Membrane.**

This method is still more or less in the experimental stage, and is being investigated by the C.S.I.R.O. in conjunction with hexadecanol. It has the advantage of of being positive. The cost of sealing a 1,500 yard tank would be about £150.

GRADE HERD RECORDING—AN ENCOURAGING REPORT

The Minister for Agriculture (Mr. C. D. Nalder), said recently that he had been greatly interested in a report on the Grade Herd Recording for the 1959/60 season which had been prepared by the Dairying Division of the Department of Agriculture.

The average yield for 12,803 cows recorded was 577 gals. of milk and 244 lb. of butterfat on a 4.2 per cent. test. The standard lactation period was extended to 300 days in the 1955/56 season when the average butterfat yield was 222 lb., so that there had been an increase of 22 lb. in the past five years.

The average number of cows in each herd was the same as in the previous year, that is, 40 cows. The improvement since the end of the war has been almost 50 per cent in herd size, the numbers improving from 28 to the present level.

The highest average was recorded for the Armadale Unit where 829 cows average 724 gallons and 274 lb. of butterfat. The average test was 3.8 per cent. The Brunswick Unit recorded the same average yield of butterfat—274 lb., but a lower yield of milk—693 gals., and the average test was 4.0 per cent.

The units in the whole-milk areas gave the highest averages of milk, for example—

Armadale	724 gals. at 3.8 per cent.
Brunswick	693 gals. at 4.0 per cent.
Harvey	656 gals. at 3.7 per cent.
Waroona	567 gals. at 4.1 per cent.
Pinjarra	600 gals. at 3.7 per cent.

The average yield of the 4,338 cows in herds in the Milk Zone was 653 gals. and 252 lb. of butterfat, at 3.9 per cent. test, compared to 538 gals. and 240 lb. of butterfat at a 4.4 per cent. test for the 8,465 cows in the butterfat areas.

It is pleasing to record also a gradual lengthening in the average length of lactation. When this was measured for the first time a few years ago it was 6.9 months only. For 1959/60 the figure had moved to 7.8 months of which the cows in the wholemilk zone averaged 8.1 and those in the butterfat areas 7.6.

This is reflected in another way in the percentage of cows which completed a full lactation period. For example, in 1955/56 30.7 per cent. completed nine months or longer. In 1959/60 the figure was 40.1 per cent.

The advantage of this is shown in the average yield of the cows which completed a full 300-day lactation period. This was 756 gals. and 320 lb. of butterfat compared to 534 gals. and 225 lb. of butterfat for those which dried off in a lesser period.

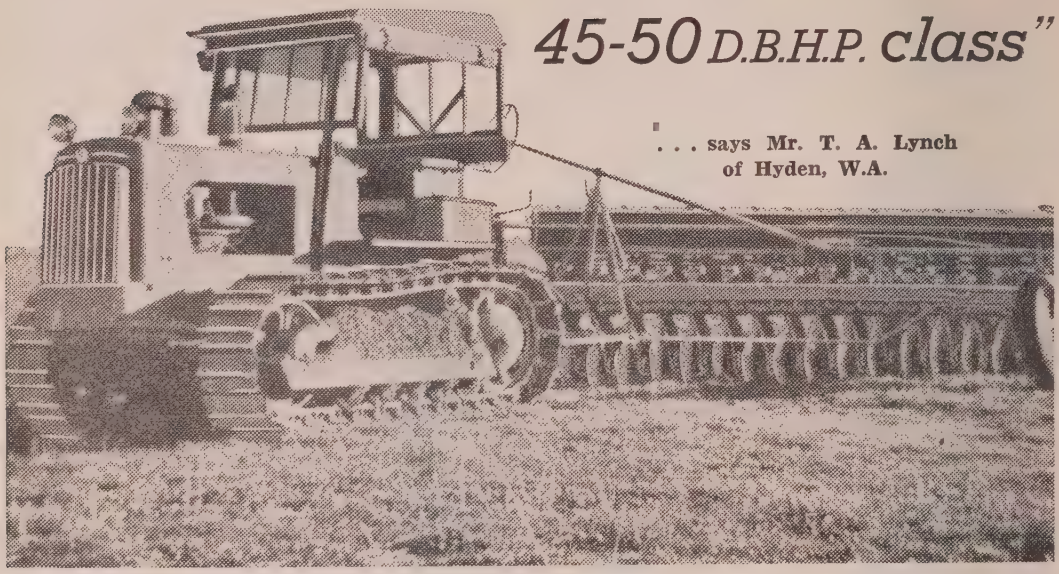
The improved percentage in the number of cows which completed a full lactation period and the increased average yield is believed to be due partly at least, to the increased number of herds which are now under test continuously. The adoption of a sliding scale of fees has proved effective in encouraging farmers to keep their herds under test.

Herd wastage was recorded at a higher level than in the previous years, total disposals amounting to 17.75 per cent. of the herds. The percentage in the previous year was 16.15 per cent.

The herd with the highest average was that owned by Messrs. P. P. and B. Edwards of Waterloo whose 51 cows average 442 lb. of butterfat, whilst the highest yielding cow was "Gloria" owned by Marchetti and Sons of Waroona, which produced 16,530 lb. of milk and 683 lb. of butterfat at a 4.1 per cent. test.

"... will outclass all tractors in 45-50 D.B.H.P. class"

... says Mr. T. A. Lynch of Hyden, W.A.



TRACK-MARSHALL

AUSTRALIA'S BEST CRAWLER TRACTOR VALUE!

MOORE

MOORE ROAD MACHINERY (W.A.) PTY. LTD.

Division of Malcolm Moore Industries Ltd.

Cr. Hay Street and Troy Terrace, Subiaco. Phone 8 2341

"The Track-Marshall is all we were told by your sales staff. In fact, it's a lot better."

Being a Fowler-Marshall man before, makes Mr. Lynch an authority on the capabilities of these rugged, hard-working tractors and he's just one of many who look to Track-Marshall and Moores for a combination of reliable work ability and service that's prompt and efficient. Track-Marshall offers many outstanding features including 55 b.h.p.; 14,500 lb. maximum draw-bar pull; long, heavy-duty 5-roller frame for long track life and increased traction; 6-speed transmission; average fuel consumption of well under 2 gallons per hour.

It's no wonder that Track-Marshall is Australia's best crawler value.

Remember, there's a TRACK-MARSHALL working near YOU! Ask the man who owns one! . . . . . Write today for full details

SILAGE COMPETITION 1959-1960

By H. G. ELLIOTT, Assistant Superintendent of Dairying

THE Australian Dairy Produce Board Pasture Improvement Committee (W.A.) have sponsored a silage competition in the dairying areas over the past three years and this has been judged by officers of the Dairying Division of this Department.

For each of these years, this Committee has offered substantial prizes totalling some £175 made up as follows:—

	£	s.	d.
Championship Award	25	0	0
First Prize Section A (six zones)	10	0	0
Second Prize Section A (six zones)	5	0	0
First Prize Section B (i) (six zones)	5	0	0
First Prize Section B (ii) (six zones)	5	0	0

The number of entries have steadily increased each year as in the initial year 40 were judged and the second year 53, while last year the number rose to 112. Three zones however, had only a few entries and it is to be hoped that this year the number of entries in zones 2—Bunbury-Donnybrook; 4—Bridgetown-Nannup and 5—Manjimup-Pemberton-Northcliffe will be greater.

Number of entries according to zones for the three years is shown in the following table:—

Year	Zones						Total
	1	2	3	4	5	6	
1957–58	13	1	8	4	11	3	40
1958–59	3	12	15	2	4	17	53
1959–60	15	4	46	1	5	41	112

The competition was in two sections: Section A dealing with quality which included material ensiled, i.e., botanical composition, maturity of the herbage at the time of ensiling, colour and aroma together with the protein content. Section B however, was for the farmer's workmanship in making and feeding out and was divided into two sub-sections one for pits and clamps and the other for stacks—and in each case it did not matter if the material was long, chopped or baled.

Generally the material ensiled for the competition silage was from pasture and in a few cases oats with clover or vetches were used.

The time of harvesting varied considerably according to districts and material handled, but from results obtained to date, much more care should have been observed with the stage of maturity of the material ensiled, as frequently the forage used was over mature. For pasture silage, harvesting should be carried out as soon as the bulk of the material is just flowering but with cereals every endeavour should be made to harvest when the bulk is showing the first emergence of the flowering head.

Frequently at the time when harvesting was taking place, cool weather and showery conditions occurred, this resulted in excessive moisture and where wilting did not take place a very high moisture content silage was the result. Analyses have shown some samples had a moisture content as high as 86 per cent. This meant only 14 per cent. of dry matter per ton whereas a silage that was made with 70 per cent. moisture had 30 per cent. dry matter per ton.

With regard to the protein content, analyses have shown that this varies very

considerably, the range being from 7 per cent. to 23 per cent. The aim when making should be to produce a silage with 70-75 per cent. moisture and 16 per cent. or better protein as this would be the best type of silage to feed to milking cows.

It is considered that this competition was well worthwhile as the farmers who entered took a lively interest in the result of their labours and were very keen to obtain as soon as possible the results of the analyses and judging.

From the results obtained from the competition, it is obvious that farmers should give more attention to:—

(1) The selection of site for stacks so that they are on dry situations.

(2) The use of movable clamps when possible and where pits are used make sure they are well drained.

(3) When harvesting try to avoid surplus moisture and endeavour to wilt the green material sufficiently to reduce the moisture content of the product to 70-75 per cent.

(4) Select clover-grass fields, or prepare clover paddocks for silage, by planting before the rain, on a slightly scarified surface Wimmera ryegrass at 4 lb. or a bushel of midseason variety of oats per acre, this to assist in reducing the high moisture content by increasing the dry matter content of the material ensiled.

(5) Allow first day's material to heat up sufficiently 90-110°F. before adding more, but when recommencing make rapidly, and control heat by rolling if necessary.

(6) Endeavour to avoid external side wastage and seal the top well when finished, by using very green lush material, well rolled, and after, if possible, cover with soil or sawdust.

(7) It is well to remember that best quality silage cannot be made from late cut or weedy material.

The competition was conducted in the following six zones—

(1) Coastal.
(2) Bunbury-Donnybrook.
(3) Busselton-Margaret River.
(4) Bridgetown-Nannup.
(5) Manjimup-Pemberton-Northcliffe.
(6) Albany-Denmark-Walpole.

Section A (Quality).

The silage was judged according to the following scale of points:—

(1) Material ensiled (botanical composition)	15
(2) Maturity of herbage	25
(3) Colour	15
(4) Aroma	15
(5) Protein	30
	100

Section B (Workmanship in making and feeding out).

This was divided into two sub-sections (i)—Silage made in pits or clamps and (ii) Stack silage. Material in each case could be long, baled or chopped. The scale of points in section B was—

	Points.
(1) Wastage	50
(2) Method of opening	25
(3) Convenience of feeding	25
Total	100

As stated earlier there were 112 entries in 1959-60 competitions which were judged by—

Messrs. H. G. Elliott,
A. W. Hobbs,
F. E. Ryan,
R. Sprivulis,
B. Williams,
A. L. Hamilton.

All officers of the Dairying Division of the Department of Agriculture.

PRIZE WINNERS, 1959-60

Championship Award

C. Campbell, Warner Glen (No. 1 entry).

ZONE WINNERS

SECTION A—QUALITY

Zone 1—Perth-Brunswick—Judge F. E. Ryan.

	Points.
(1) Messrs. V. Poller & Son, Roelands	75.5
(2) D. R. Hodgson, Waroona	72.0

Zone 2—Bunbury-Donnybrook—Judge B. Williams.

	Points.
(1) M. Bell, Elgin	79.5
(2) G. O. W. Jenkins, Elgin	68.0

Zone 3—Busselton-Margaret River —Judge A. Hamilton.

	Points.
(1) C. Campbell (No. 1) Warner Glen	82.0
*C. Campbell (No. 3) Warner Glen	75.5
*C. Ironmonger, Karridale	75.5

* Equal 2nd.

Zone 4 — Balingup-Bridgetown — Judge A. W. Hobbs.

	Points.
J. E. Bentley, Bridgetown	61.0

No awards—only 1 entry.

Zone 5 — Manjimup-Northcliffe — Judge A. W. Hobbs.

	Points.
(1) A. A. Hewson, Northcliffe	74.0
(2) J. J. Littlefair, Pemberton	73.5

Zone 6—Albany-Denmark-Walpole—Judge R. Sprivulis.

	Points.
(1) E. Bellanger, Nornalup	81.5
(2) R. C. Langley, Denmark	79.5

SECTION B—SUB-SECTION (i)
(Pits or Clamps)

	Points.
Zone 1: N. Marsh & Son, Mundijong	80
Zone 2: No entry.	
Zone 3: C. C. Ironmonger, Karridale	85
Zone 4: No award.	
Zone 5: J. J. Littlefair, Pemton	85
Zone 6: W. Baxter, Albany	87

SECTION B—SUB-SECTION (ii)
(Stacks)

	Points.
Zone 1: J. A. Phillips, Coolup	82
Zone 2: M. Bell, Elgin	89
Zone 3: C. Semmons, Abba River	85
Zone 4: No entry.	
Zone 5: J. C. Waugh, Manjimup	80
Zone 6: E. Bellanger, Nornalup	89

The Australian Dairy Produce Board Pasture Improvement Committee (W.A.) has decided to conduct a similar competition again this year with prize money as previously.

It must be remembered that entries can be accepted only from those farmers whose silage is used mainly for feeding dairy cows and that the competition entries close on 31st December.

JUDGES' COMMENTS

H. G. Elliott—Championship.

The silage entry submitted by Mr. C. Campbell of Warner Glen which was awarded the Championship was made from a mixture of subterranean clover and annual grass pasture but harvested a little on the mature side without wilting.

The material ensiled was a fairly well balanced clover grass one with practically no weeds present.

The silage was well and carefully made in a stack which showed little external side and top wastage and was of a uniform colour and aroma.

Although the silage was fairly high in moisture content (77.9 per cent.) the protein content was high (19.3 per cent).

F. E. Ryan—Zone 1.

The enthusiasm of competitors was most encouraging. Most had made silage previously and are now convinced of its value. Their interest now is improving the product and utilising it more effectively.

The importance of botanical composition in producing high protein silage was emphasised this year. Best silages were those made from vigorous clover-grass pastures and highest protein was obtained in silages from paddocks with a high proportion of clover. Oats proved disappointing in that oaten silages were generally low in protein and in some instances difficulty had been experienced in compressing the material sufficiently to exclude air. Several of the entries were of good quality as judged by colour, maturity and aroma, and these show that with a little experience good quality can be achieved.

In zone 1, dry matter content was better than in previous years, but even this year some of the silages were considered too wet.

There was a good variety of stacks, clamps and pits included in the judging and much thought given to methods of preserving and feeding out. One stack was enclosed on four sides with removable galvanised iron wall to prevent side wastage from the effects of wind. In this stack wastage was comparatively small.

Most farmers were careful in cutting out of the stack to ensure that the minimum area of face was exposed to avoid wastage. In one case, self feeding was adopted and it was efficient in saving of labour even though it resulted in some losses from over exposure to new faces. Stock grazed the dry pasture as well as silage when they had free access to the stack. Some ingenuity in feeding out was encountered.

A circular saw blade, from which the teeth were filed, attached to a long arm with a three point linkage was effective for making vertical cuts through a wedge stack but cutting too much at one time encouraged some wastage. The short buck-rake was very efficient for lifting out blocks of silage once the vertical cut had been made.

The winning entry was submitted by V. Poller & Sons of Brunswick. This was cut from a vigorous pasture paddock of Yarloop subterranean clover and ryegrass. The crop was cut and ensiled in September. This provided excellent material with a high protein content. Some points were lost for wastage and the silage was considered to be over-wet. It could have been improved by wilting. Mechanical methods of cutting out from the clamp were employed and these proved effective.

The second prize was won by D. R. Hodgson of Waroona. This was also composed largely of Yarloop subterranean clover in a well made circular stack.

The moisture content of this stack was high but the material was well preserved. More attention could be given to wilting before ensiling.

Appreciation of the value of silage for summer feed has resulted in a very large increase in the amount of silage conserved in recent years and this was obvious amongst all competitors in zone 1.

Zone 3—A. L. Hamilton.

The increased interest being shown in this area in conserving spring pasture growth in the form of silage is reflected in the larger number of entries recorded for this year's competition. Twenty-five farmers lodged entries for a total of 46 stacks, pits or clamps.

More extensive use was made of the forager type machines this season, 29 of the 46 entries being harvested by this method, compared with 7 out of a total of 16 entries last season.

Feeding value of the silage sampled this season was below that of 1958-59 competition, the average figures for this zone being—

1958-59—77.6 per cent. moisture and 14 per cent. protein.

1959-60—79.1 per cent. moisture and 12.9 per cent. protein.

It seems likely that the drop in the protein figure may be due to the fact that seasonal conditions favoured the growth of inferior species at the expense of subclover, and the greater proportion of earlier maturing grass species was responsible for a lower protein material at harvesting. There was also a tendency for pasture growth—particularly weedy species—to get ahead of the stock early in the season, and the fact that these paddocks were in some cases shut up early, could have resulted in a material at cutting time which was lower than usual in protein. Higher moisture content may have been due to the greater proportion of capeweed in pastures ensiled.

In several instances substantial saving of surface wastage was accomplished by covering stacks with earth using a front end loader, and using a blade to remove the earth seal prior to feeding out.

The wastage aspect in general still requires attention in order to retain a greater amount of the material as a palatable and nutritious feed.

Improvement could be obtained by better methods designed to give a more even levelling and spreading of the material in the stack with particular attention to the side walls of clamps and pits to prevent air penetration and subsequent mouldiness.

Zones 4 and 5—A. W. Hobbs.

A total of six entries only were judged in the two zones. There was only one entry in zone 4 and five in zone 5. Although there is more silage made in both zones it

is unfortunate that a greater number of entries were not received in the competition.

Entries in the two zones included stacks and pits made from chopped and long material and in all cases the silage made was of high moisture content, and the main materials used consisted of pasture and oats.

Lack of sufficient consolidation together with inefficient surface sealing led to considerable wastage in some instances.

Zone 6—R. Sprivulis.

Interest in the silage competition was very keen in the Denmark district.

In 1957-58 there were only 5 entries.

In 1958-59 it increased to 17 entries and in 1959-60 as many as 41 entries were registered and judged. It is estimated that approximately 1,175 tons of silage from 300 acres was submitted for this competition.

The largest quantity of silage made on one dairy farm was approximately 225 tons. The other largest entries were—

1—110 tons.
1—90 tons.
1—84 tons.
1—70 tons.

The most popular entries were single wedge stacks erected on hillsides made by buckrake and tractor from long material (895 tons). Only 105 tons were made in inverted saucer and loop shaped stacks from chopped material. One hundred and seventy tons of chopped material was ensiled in pits. The least original wastage was observed in pits, on some occasions as low as 5 per cent. The average original wastage was approximately 13 per cent. In one instance where the compaction was poor, original wastage was as high as 36 per cent.

Most of the silages were made from material insufficiently wilted which gave very high moisture content in the final product.

The best silage was made by Mr. E. Bellanger at Nornalup. The ensiled material consisted of white clover, Yarloop and perennial ryegrass. Silage was made in a single wedge stack. After compaction the top of the stack was covered with bags and then with 6 in. of soil with a small trench around the stack for drainage. This is the second year Mr. Bellanger has been making silage. Last year he scored 76.5 points and had the third best entry in this district.

The improvement in aroma and moisture content was mainly due to wilting of the green material just prior to stacking and compaction. Visual wastage did not exceed 8 per cent.

KEEP YOUR JOURNALS

HERE at the production end, we are sparing neither expense nor effort in making the "Journal of Agriculture" a publication which will help you in your farming operations.

We suggest that the Journal is worth keeping and that a year's issue will make an attractive and useful volume for your library—a volume that is full of sound factual information, attractively presented.

Arrangements have been made for the compilation of a comprehensive index to be incorporated in the December issue—a feature which will greatly enhance the value of the Journal as a work of reference.

THE KING OF PUMPS!

For bushfire fighting, medium pressure irrigation, stock water, domestic water, washing down dairies, outhouses, etc. . . . Rex self-priming pumps are most reliable and efficient. Models are available in capacities from 4,500 to 45,000 gallons per hour. Send for details!

Westfarmers Tutt Bryant Pty. Ltd.

RAILWAY AVE. BASSENDEAN. PHONE 79 1616

FERTILISER TRIALS WITH POTATOES

Harvesting the experiment.—Mr. R. Rice on the tractor

MANJIMUP, 1958-59

By T. WACHTEL, B.A. B.Sc. (Agric.), Adviser, Horticultural Division

THIS experiment was the third of this type carried out in karri loam soils. Significant yield responses were obtained from increasing rates of fertiliser applications. The results appear to be generally consistent with those obtained previously in the area.

(For previous experiments see: Journal of the Department of Agriculture of Western Australia, Vol. 6 No. 5, Sept.-Oct., 1957, and Vol. 7 No. 5, Sept.-Oct., 1958.)

In two previous experiments carried out in 1956-57 and 1957-58 complete fertiliser mixtures were tested. The mixtures consisted of ammonium sulphate at rates varying from 1½ to 9 cwts. per acre, superphosphate at rates varying from 3 to 32 cwts. per acre and muriate of potash with rates varying between 1 and 4 cwts. per acre. In both experiments 6 cwts. of ammonium sulphate per acre gave the highest total and first grade yields, while higher rates had no further effect. Concerning the rate of superphosphate, in both experiments the rate resulting in highest yields was about 24 cwts. per acre. The need for potash was not conclusively demonstrated in either of the experiments. Both experimental crops were sprinkler irrigated and no topdressing was applied.

In the present experiment the rates of fertiliser components were as follows:—

ammonium sulphate	....	....	4,	6	cwt.	per acre.
superphosphate	....	....	15,	20, 25	,,	,, ,,
muriate of potash	....	0,	1,	2	,,	,, ,,

In addition to the above fertiliser rates the trace elements copper and zinc were added to all plots in the experiment at the rates of 60 lb. of crude copper ore and 5 lb. of zinc oxide per acre.

A further aspect of fertiliser application was introduced into this experiment; while the whole amount of superphosphate was applied at planting time, only one half of the nitrogen and potash fertilisers was used at the time of planting and the other half in the form of side-dressing at a later stage.

The different rates of fertiliser components together with the two methods of application when combined in all possible ways gave a total of 36 treatments. The plots contained three rows of 46 plants each and covered an area of approximately 1/125 acre. Each treatment was replicated four times and the total area of the experiment was nearly 1½ acres.

Planting of the experiment was carried out between the 18th and 22nd of August, 1958, on the property of Rice Brothers at Eastbrook. The area was in the vicinity of the one used for a similar experiment in the previous year and had the same

aspect. It had been newly cleared and ploughed once shortly before the experiment was commenced.

Cut setts of the average size of 2 oz. were used for planting. The setts were dipped in a suspension of zinc oxide before planting, and then planted about 6-8 inches deep in rows 2 ft. 6 in. apart and spaced 12 in. apart in the rows. A three furrow ridger was used to open up the furrows as well as cover the planted rows. The fertiliser mixtures were placed on the side of the furrows, to the side and slightly below the level of the seed pieces, and as far as possible out of direct contact with them.

Those plots which received the split applications of fertilisers were side-dressed on the 20th October when the plants were about 6-8 in. high.

As in previous experiments, sprinkler irrigation was again applied, and this together with the natural rainfall received during the growing period of the crop amounted to about 17 inches of water.

The experiment was harvested between the 15th and 20th of December, and total as well as first grade yields were recorded for each treatment plot. For the purposes of the experiment tubers damaged during digging operations or otherwise accidently injured were considered first grade, and their weights were added to the first grade yields.

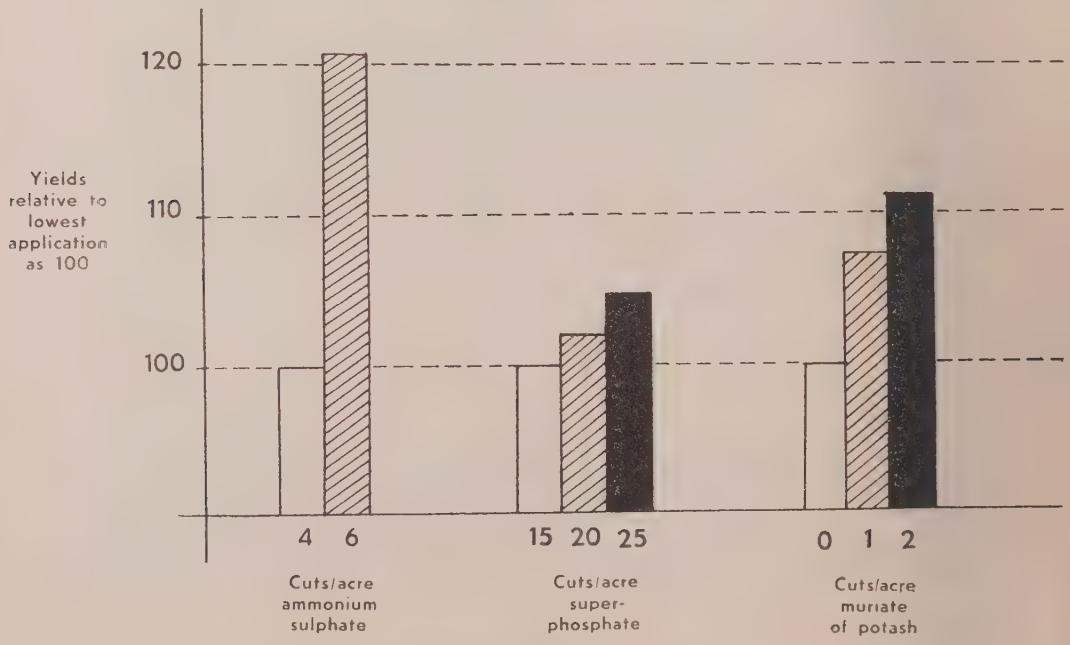
First grade yields from the different plots calculated to an acre ranged from about 7½ to 13½ tons. The responses to the three individual fertiliser components were as follows:—

(1) **Nitrogen.**—Ammonium sulphate at the rate of 6 cwts. per acre resulted in significantly higher yields than at 4 cwts. per acre.

(2) **Phosphate.**—Yields from the application of 25 cwts. of superphosphate per acre were significantly higher than those from the application of 20 cwts. per acre, and this latter rate, in turn, gave significantly higher yields than the application of 15 cwts. per acre.

(3) **Potash.**—The three levels of potash were significantly different in their effects on the yields; 1 cwt. of muriate of potash gave a significantly higher yield than when no potash was applied, and there was a further significant yield increase when the rate of muriate of potash was increased to 2 cwts. per acre.

Concerning the split application of ammonium sulphate and muriate of potash as compared with that part of the experiment in which all fertilisers were used at



the time of planting it was found that the latter method resulted in significantly higher yields in every case.

The differences in first grade yields appeared to be high enough in every case to more than repay the extra costs associated with the increased rates of fertilisers.

OVERALL EFFECTS OF THE THREE FERTILISER COMPONENTS

		Mean yields of first grade potatoes	Yields relative to lowest application as 100
		tons/acre	
Ammonium sulphate, cwt./acre	4	10·1	100·0
	6	12·0	120·9
Superphosphate, cwt./acre	15	10·8	100·0
	20	11·0	102·0
	25	11·3	104·6
Muriate of potash, cwt. /acre	0	10·4	100·0
	1	11·2	107·4
	2	11·5	111·3

The results are tabulated above, and are also illustrated diagrammatically, showing the overall effects of the three individual fertiliser components. As split applications of fertilisers resulted in greatly reduced yields in every case, only that part of the experiment in which all fertilisers were applied at planting time has been considered.

ACKNOWLEDGMENTS

Grateful acknowledgment is made to Messrs. Rice Brothers of Eastbrook, who for the second year in succession made the area and equipment available for the experiment as well as extended their co-operation in all phases of the experiment.

Acknowledgment is also made to officers of the Horticultural Division of the Department of Agriculture who assisted with the field work, and particularly to Mr. G. de Haan, Vegetable Instructor of Manjimup whose assistance, as in previous years, very greatly contributed to the successful completion of the work.

The statistical analysis of the experimental results was carried out by the Biometrics section of the Plant Research Division.

This fine dense stand of bluebush (*Kochia brevifolia*) **at Kulin has resulted from fencing to exclude stock and roughening to catch seed and assist moisture penetration. A perennial suitable for salt land in the outer wheatbelt, it can make this type of country highly productive.**

BAYER RESEARCH

produces new answer to

FRUIT FLY MENACE

NEW 'TRIPLE-ACTION' INSECTICIDE KILLS FRUIT FLY
— ADULTS AND MAGGOTS — AND OTHER PESTS

• BY CONTACT
• BY PENETRATION

• BY SEMI-SYSTEMIC EFFECT

HERE IS AN INSECTICIDE WHICH CONTROLS ADULT FRUIT FLY AND AT THE SAME TIME PREVENTS MAGGOT DEVELOPMENT WITHIN THE FRUIT!

LEBAYCID

is a completely new organic phosphorous insecticide developed by Farbenfabriken Bayer A.G., of Leverkusen, W. Germany—the creators of Folidol E605, Dipterex, Metasystox 'I' and Gusathion. It is unique in its power to operate three ways: as a contact spray; by partial absorbtion into the plants—killing maggots as they feed; and by penetration of the fruit, killing fruit fly larvae as they hatch. .

LEBAYCID also controls other important pome and stone fruit pests (e.g. peach tip moth and codling moth). On tomatoes, Lebaycid also shows promise as an effective means of suppressing mites, aphids and bugs.

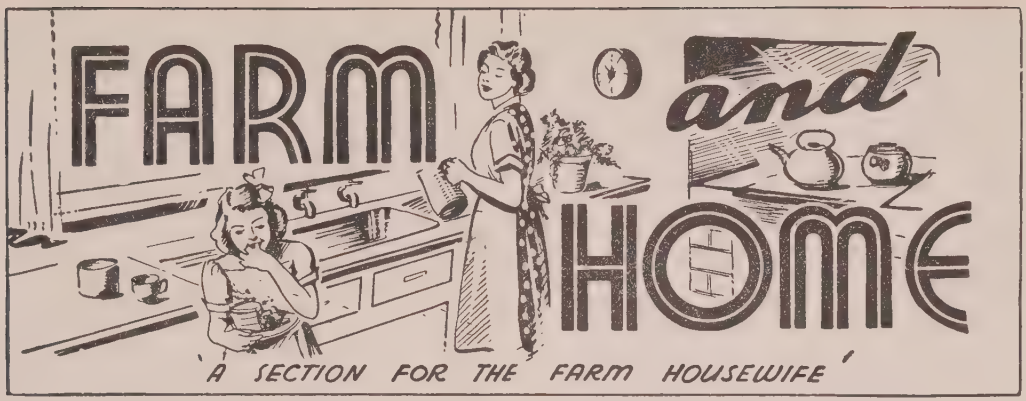
AVAILABLE IN BOTTLES OF 1 OZ. AND 4 OZ. AND TINS OF 1 PINT

Lebaycid®
FRUIT-FLY KILLER

ORDER SUPPLIES **NOW** FROM YOUR LOCAL STOCKIST

Distributed by **HENRY H. YORK & CO. PTY. LTD.**
Sydney ● Melbourne ● Brisbane ● Adelaide ● Perth

(R) Registered Trademark of Farbenfabriken Bayer A.G., Germany.



Preserving and Pickling

By O. EVANS

AT this time of the year many housewives wish that fruit trees would bear little and often throughout the year rather than a lot in a comparatively short space of time.

We preserve fruits to try to spread this short period, and to have them on hand to vary menus when fruit is out of season. A cupboard shelf packed with bottles of colourful, neatly arranged preserved fruits is indeed a satisfying sight.

Bottling is the most popular method, with pickling being done to a smaller extent.

PRESERVING

Choice of Fruit for Preserving.

When preserving fruit, aim to keep the best possible flavour, colour and food value.

Choose fruit in season, firm textured and fully ripe—not under or over ripe. Avoid any marked or bruised fruit. It is not worth while preserving below-standard fruit, although small or marked fruit could be preserved diced, as pulp, or in fruit salad.

Have fruits of uniform size and ripeness to ensure equal heat penetration. Fruits should be freshly picked. If any time has to elapse before preserving, keep them in a cool, dark, well ventilated place—soft fruits well separated—to prevent the characteristics of freshness deteriorating.

Choice and Preparation of Jars.

Choose straight sided, wide-necked jars for easy packing and removal of fruit. Clear glass allows the colour of the fruit to show through best. Avoid the green tinted glass or jars with flaws and cracks. Jars should all be the same size.

If you exhibit in shows it is a good idea to have a set of smaller jars, and pack one of them when preserving each different fruit. At the end of the season you should then have enough to enter in the "Collection of Fruit" section.

As presentation counts when competing, a set of similar jars will gain a few more marks than a collection of jars of different sizes. The smaller jars are also more convenient for carrying than the larger home size jars. Heat the small jar carefully, preferably separately, noting time and temperatures as it will be finished before the larger jars.

Inspect rings and lids. Do not use rusted lids and take no risks with stretched sealing bands—new lids, clips and rings can be bought separately quite cheaply. (The stretched rubber rings are handy for holding the greased paper over the top of a steamed pudding!)

Wash thoroughly, rinse and dry the bottles, lids and rubber rings.

Preparation and Packing of Fruit.

Wash the chosen fruit thoroughly and dry well. Fruits which are peeled should be peeled thinly and neatly from stalk to end. If cut in pieces, keep size uniform. From core fruits remove core with spoon or special coring knife. Do not leave any pieces of fibre or husk at the centre. Drop peeled and cored pieces or halves gently into cold salted water to prevent surface browning while waiting to pack. Rinse before using. To skin peaches, dip in caustic soda solution (one dessertspoon soda to one quart of warm water) for five seconds, rinse in cold water and rub off skin.

When packing into jars have fruit cut side downwards and rounded outside showing, and overlap pieces attractively. Pack to within half an inch of the top of the jar. Pack as tightly as possible as fruits shrink slightly after sterilisation.

Syrup.

The syrup varies according to taste and type of fruit. Generally, small, sweet, soft fruits are preserved in thin syrup (one part sugar to three parts water); large fruits and berries in medium syrup (one part sugar to two parts water); and acid or tart fruits in heavy syrup (one part sugar to one part water). Banana pulp may be preserved in thin syrup; quinces and grapes in heavy syrup. Use an extra heavy syrup (two pounds of sugar to one pint of water) for figs, rhubarb, and passionfruit pulp. For other fruits a medium syrup is used.

To make syrup, dissolve the sugar in the water over low heat, bring to the boil and boil for three minutes. Strain if necessary.

Add syrup to each jar, a small cupful at a time, and allow air bubbles to come to the surface. Place a spatula or long bladed knife down the side of the jar to help any obstinate air bubbles to rise (avoid bruising the fruit). Fill jar with syrup to within half an inch of the top. (This head-room will allow for expansion when heated.)

Jars should be almost full and packed tightly, as the greater the amount of syrup used the greater the amount of floating and apparent shrinkage.

Preserving Without Sugar.

Fruits can be preserved in a liquid consisting of fruit juice and hot water. If for dietary reasons sugar is not used but a sweet syrup is desired, use an artificial sweeting agent according to the manufacturers instructions.

Preheat the fruit in a small amount of water over low heat, then pack quickly into warm jars. Have fruit juice hot and if not enough make up to the necessary amount with hot water. Process as for syrup-preserving.

Sterilising.

There are several methods of heating and sterilising the bottles. In some the jars are sealed before heating, in others the jars are loosely lidded for heating and sealed while hot when sterilisation is complete. In some methods the fruit is cooked by steaming, in others the water comes only a few inches up the side of the jars, or the jars are completely covered with the boiling water.

If a thermometer is not built in on your container, use a sugar boiling thermometer when sterilising to ensure that the correct temperature is maintained. A "home steriliser" can be made by standing a platform about an inch up from the bottom of a copper or large preserving pan. (A wire cake cooler covered with a thick cloth would serve the purpose). The thermometer should stand on the platform.

Temperatures and times vary for different fruits—follow the manufacturers instructions for your bottling outfit or type of jars. Bring slowly to the required temperature, taking one to one and a half hours. See that the bottles are not touching each other nor the sides of the pan or container, and that they are standing on the platform with the right amount of water according to instructions.

Oven Sterilising.

The screw lid type of jar may be used for oven sterilising. This method is only suitable for gas or electric ovens fitted with a reliable thermostat, as it is difficult to obtain an exact temperature with wood fuel stoves.

Preheat the oven at 200° for 20 minutes. Pack the heated fruit in warm jars and fill with hot syrup. Place seal and screw lid loosely. Stand jars on thick cloth in a baking dish, with hot water coming one inch up the outside of the jars. Process 30-45 minutes. Screw lids tightly.

With this method there is a loss of colour and flavour, the danger of incomplete sterilisation, and of jars exploding.

Cooling and Storing.

Bottles must be cooled carefully; do not stand on a cold or hard surface nor place in a draught. Stand jars on a dry cloth or board or linoleum. Do not open jars to "top-up" liquid—loss of liquid does not affect keeping qualities and reopening will allow the entry of organisms which will cause later spoiling. When cold check seals. (If clips are used do not remove till cold.)

Store in a cool dark cupboard.

Sometimes fruits float to the top of the jar. This is caused by using over-ripe fruit, processing too long or at too high a temparature, using too heavy a syrup for the type of fruit, or packing fruit too loosely and using too much syrup. If the syrup becomes clouded you have probably used under or over ripe fruit and too long a processing time at too high a temperature.

The Pressure Cooker.

The pressure cooker can be used for sterilising smaller jars containing vegetables or fruit, particularly when doing very small quantities as in passion-fruit pulp or for competing in shows. Improvise a rack or platform to stand on the bottom of the cooker and follow the directions and times given in the instruction booklet for your type of cooker.

PICKLING

This is a method of preservation in which spices and condiments are used. The fruits or vegetables are generally brined first, then preserved either sweet or sour in a spiced vinegar. Pickles should only be used occasionally as a relish, because condiments are irritating to the digestive tract.

Choice of Foods and Utensils.

The fruits and vegetables to be pickled should be fresh, firm, medium sized and just ripe—not over-ripe. Suitable foods are beetroot, cabbage, cauliflower, small cucumbers, onions, marrows and beans, walnuts, pears, plums, figs and grapes.

Choose enamel or earthenware utensils. Never use copper, iron, brass or aluminium as dissolving of some metal and discolouring of food would take place. The jars should be glass or earthen, wide necked, free of cracks, and sterilised, with tight-fitting lids. If using corks, sterilise by boiling before use, and make seal completely air-tight with melted wax.

Brining and Osmosis.

Most fruits and vegetables have a high proportion of water. This can be reduced by soaking in brine so that the vegetable water does not dilute the pickling solution.

To make brine, dissolve one pound of salt in one gallon of water. The best type of salt is dairy or pickling salt or salt to which no anti-caking substance has been added. Avoid using table salt as this would cause discoloration of food.

Brining works by the process of osmosis, which is simply this: when two liquids of different strengths are separated by a semipermeable membrane, they tend to equalise their strength by flowing one towards the other, and the flow of the weaker to the stronger is greater than the flow in the opposite direction. In brining, the vegetable water or juice (a weak solution) is separated by the vegetable skin (a semipermeable membrane) from the brine (a stronger solution) so that the vegetable water is drawn from the vegetables which are flavoured a little from the salt from the brine. If vegetables are brined too long they lose too much water and shrivel; if not long enough (or the brine is too weak) they become soft and watery.

Most vegetables are brined overnight. Beetroot is boiled in salted water and does not need brining. For pickled onions, brine in skins for 12 hours, peel, then place in fresh brine for 24 hours. Make fresh brine for each lot of vegetables.

Pickling Solution.

Vinegar is the basis of the pickling solution, which is flavoured and spiced according to taste and the food to be pickled. It can be sweet or sour. Use a good quality vinegar—brown malt vinegar is best.

Here is a basic pickling solution recipe which can be varied as necessary. For a sweet solution add two or more ounces of sugar to taste.

Pickling Vinegar.

1 quart of brown malt vinegar.
½ oz. cinnamon bark.
½ oz. mace (or ½ oz. grated nutmeg).
½ oz. allspice.
½ oz. cloves.
Pinch cayenne or powdered chilli.
6 peppercorns.

Method.—Bring to boil in a covered enamel saucepan. Stand on side of stove with lid on for two hours. Strain just before using.

The pickling solution also must be the right strength—if too weak it will cause the food to become soft and watery, and if too strong the foods will become shrivelled and tough—the process of osmosis at work again as in brining.

If the vegetables have not been brined long enough and their water content is too high, that water will flow into the stronger pickling solution, causing tough wrinkled pickles, and there is a possibility of them being inadequately preserved owing to the dilution of the solution by the vegetable water.

Method of Pickling.

Prepare fruits and vegetables, brine. Rinse and drain and heat quickly in the strained spiced vinegar—do not boil. Pack into the heated jars, cover with the pickling solution and seal at once.

Keep at least a month before using. Store in a cool dark place.

Of Things to Come.

Many of you have been making jams and preserves. Save those hessian sugar bags.

Useful and attractive ways of making use of these will be given from time to time.

HELEN M. GLOSTER.

LAND GRADING IN IRRIGATION AREAS, 1959/60

The Minister for Agriculture (Mr. C. D. Nalder), has announced that during the year a total of 1,730 acres of land was graded in the irrigation areas. This is an increase of 90 acres on the 1958/59 season. Of this area Government controlled machines handled 918½ acres on 107 farms and private graders 811½ acres on 67 farms.

The average time taken to grade one acre of land by Government machines was 1.87 hours at a cost of £7 19s. 7d. per acre.

As in previous years the bulk of the land graded goes immediately into production as shown in the following table:—

	Acres.
Permanent pastures	648
Annual pastures	209
Fodder crops	683
Fallow	56
Potatoes	51
Vegetables	73
Orchards	10
Total	1,730

Over the past 11 years a total of 9,873 acres have been graded by Government controlled graders and 6,695 acres by contractors and farmers, making a total of 16,568 acres. This figure includes land that has been graded more than once.

During the season approximately 18 miles of drains were excavated by Government machines. Over the past 11 years a total of 260 miles of drains have been excavated by Government machines alone.

Dealing with the future prospects for grading there seems to be no tendency for the demand to slacken off.

Our thanks are due to the co-operation of the various officers of the Public Works Department in the above operations.

Local Control OF CROWS BY TRAPPING

By C. J. WOODBURY, Regional Vermin Control Officer

THE common crow seen frequently around farms in the South-West is the raven (Corvus coronoides) whilst the pest of pastoral areas is the true Australian crow (Corvus cecilae). Farmers and pastoralists, although recognising the importance of these birds as scavengers and destroyers of insects, particularly grasshoppers, sometimes for one reason or another, wish to reduce their numbers over a localised area. Baiting with phosphorus has been used in the past, but the purpose of this article is to describe and illustrate a type of trap which has become universally known as the "Australian Crow Trap."

CROW SPECIES

There are three species of crow to be found in W.A. (Occasionally another specie —the "Ceylon" Crow makes a brief appearance but so far has not, to our knowledge, become established.)

The Australian Crow

(Corvus cecilae)

Found all over the State except the South-West. It probably does not exist where the raven is found. It is the pest species in the northern and inland parts of the State.

The Little Crow

Found over the region from Hall's Creek, North-West and as far South as Victoria Plains. Is not usually considered a pest.

The Raven

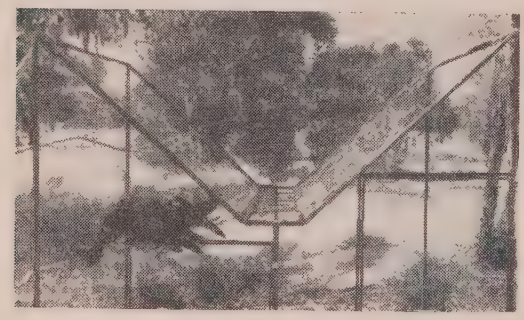
(Corvus coronoides)

This bird is confined to the South-West Land Division. This is the main crow species against which our efforts are directed. I have already stated that this bird is a useful scavenger. However, at certain times of the year, farmers experience a little trouble from this pest. This is most apparent at lambing time when

The crow trap. This can be loaded on to a truck by one man for transport to other parts of the farm

the newly born lamb and even the lambing ewe herself, are sometimes attacked. The birds will take eggs from the farmer's poultry run also.

None of the crow species are protected in W.A. and farmers may take whatever steps they consider necessary to control them. One way which has been used successfully to control this pest is by the use of the crow trap described hereunder:



Another view of the trap—note the door on the right hand corner

AUSTRALIAN CROW TRAP

This trap has been tried and tested over the years in all parts of Australia having proved both humane and effective under a wide variety of conditions. How effective it is can be seen in the accompanying photographs taken of an actual trap on the property of Mr. Bruce Boxsell of Narrogin. This is a cage type trap of the self operating type, carrion being used as a lure. The principle of its operation is simple. The birds enter the trap through any of three openings each nine inches square, in the depression at the top. In trying to escape they will go to the outer walls rather than the openings in the middle of the roof.

There is no set rule in regard to dimensions except that it is desirable that the trap should be high enough to permit the operator to capture and remove the imprisoned birds without discomfort. The trap illustrated with a base six feet square, and a height of six feet at the corners, with the centre apertures four feet six inches from the ground, will be found satisfactory. The central supports for the openings are nine inches apart. The space between the openings should be covered with board or rabbit netting and the openings can be funnelled to a depth of six inches for extra safety.

A door should be built into one corner to permit access to the interior for the removal of the captured birds.

Material for the frame work of the trap can be obtained from the farm scrap heap. The trap illustrated was constructed out of scrap half inch diameter piping and has the advantage of being light enough for one man to load on and off a truck.

OPERATION OF TRAP

The crow trap should be placed near pig pens, fowl yards, lambing paddocks or any place to which the birds are partial. It may be baited with offal such as dead sheep, rabbits or poultry. It is well to provide perches and to avoid unnecessary suffering, a water tin should also be provided.

When the trap is in operation, it is important that the birds should be removed at night when there is no danger of other crows in the vicinity being frightened. It is well to leave two or three crows alive in the traps for the next day so as to provide an attraction for the intended victims.

If the trap described and illustrated here is used and operated wisely, it will materially assist farmers and pastoralists to reduce unwanted crows from around homesteads from feed sheds, poultry houses and other places where these birds tend to congregate.

A crow trap 6 ft. x 6 ft. x 6 ft. constructed of half-inch scrap pipe. The 9 in. x 9 in. entrances can be seen along the base of the V section

It should be borne in mind that these birds serve some purpose and play an important role in scavenging the countryside. The removal of those birds which frequent habitation should however, not materially upset any natural balance that exists.

CALTROP

The Director of Agriculture (Dr. T. C. Dunne) stated that Caltrop had appeared, both in the Agricultural districts and the metropolitan area.

Commonly known as Puncture vine in America, the burrs of this trailing plant, as the name implies, puncture bicycle tyres, but more important to the farmer, can cause lameness among stock by penetrating their hoofs. Although no cases of poisoning have been reported so far in Western Australia, South African investigations have shown that the plant has harmful properties and losses of sheep in New South Wales and Queensland have been attributed to eating it.

Even city dwellers cannot disregard Caltrop for, besides the risk to bicycle tyres, the burrs can be just as uncomfortable as those of Doublegee.

Dr. Dunne said that care should be taken to prevent the introduction of seeds, especially with stock, fodder and rubber tyres. If plants do appear, they should be destroyed promptly as seeds can mature in a few weeks, and then may remain in the soil in a viable condition for a number of years. Isolated plants should be pulled and any seeds present destroyed by burning. Patches can be killed by spraying with oil. Diesolene or power kerosene is suitable and can be mixed with old sump oil. 2,4-D is also effective but must be used with care in the vicinity of gardens. It is important to spray before the seeds have formed.

During the past two years the Agriculture Protection Board, in co-operation with local authorities, has operated a number of mobile spraying units. In the country districts these have concentrated on infestations from which spread was most likely to occur, particularly railway and stock yards and street verges. Despite many difficulties, especially a series of germinations due to summer rains, the results obtained must be regarded as satisfactory.

Towards the end of last summer a limited survey was carried out to ascertain the extent of the weed on private properties and control measures being taken by farmers. Ninety properties were visited in a district where Caltrop has been known to occur for a number of years. The weed was present on more than half those inspected. In most cases it was growing mainly around the homestead but on nine farms was spread over more than 20 acres, and on one of these the area exceeded 200 acres. Some control measures had been carried out on 20 holdings, but in only eight cases could the results be regarded as effective.

Dr. Dunne said that it would appear some farmers do not regard Caltrop very seriously. He pointed out, however, that the work carried out by the mobile spray units would lose much of its value unless control measures were undertaken on the farms, themselves. A more concerted effort against this weed is necessary if it is to be kept within bounds.

ALWAYS BUY Western Australian DRIED FRUITS

Boiled Bake Fruit Cake

- ¼ lb. butter or margarine
- 1 cup of sugar
- 1 cup of boiling water
- 1 cup of sultanas
- 1 cup of raisins
- 1 cup of currants
- Add little lemon peel or grated rind of orange and lemon
- 1 teaspoon mixed spice
- 1 teaspoon cinnamon

Method.

Boil all these ingredients together for three minutes. Allow to cool.

Then add the following ingredients—

- 2 cups of S.F. flour.
- ½ teaspoon of carb. soda.
- 2 well beaten eggs.
- Juice of half a lemon and half an orange.

Beat all well together, place in a well-greased cake tin and bake in a moderate oven for one hour.

Bluebush Seed

CLEANING, DRYING and STORING

By C. V. MALCOLM, B.Sc. (Agric.), Soils Division

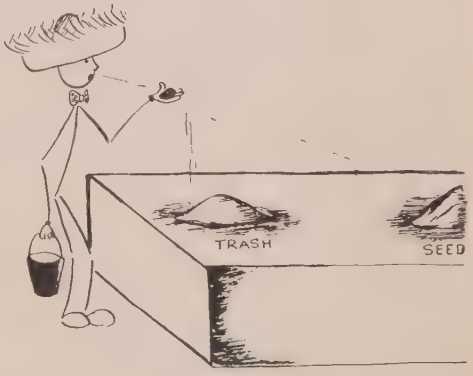
BLUEBUSH (Kochia brevifolia) is a perennial plant which occurs naturally in Western Australia. In the past it has attracted little attention, but in recent years it has created interest as a highly nutritious and salt tolerant plant well adapted to certain salt affected soils in the wheatbelt. A previous article (Bulletin No. 2630) by Smith and Malcolm drew attention to its use. One of the problems in establishing bluebush is to obtain seed supplies.

With the advance of warm weather, bluebush begins to make rapid growth, with flowering and seed production commencing in late November and continuing into July. Seed may be collected during this period, dried as quickly as possible, and stored ready for sowing. An account has already been given of collection methods (Bulletin No. 2732). Aspects which have not received much attention are those relating to seed treatment and storage.

Bluebush seed is very sensitive to curing and storage conditions. Incorrect handling of seed after harvesting can mean the difference between 90 per cent. and 10 per cent. germination, which adversely effects establishment of seedlings.

CLEANING

Harvested samples contain a variable amount of leaves, insects, and trash, the percentage of seed varying with the nature of the bushes from which the sample is taken and the vigour with which they are shaken. It is easy to collect a clean sample from bushes heavily laden with ripe seed. Rubbishy samples may be cleaned by sieving and winnowing.



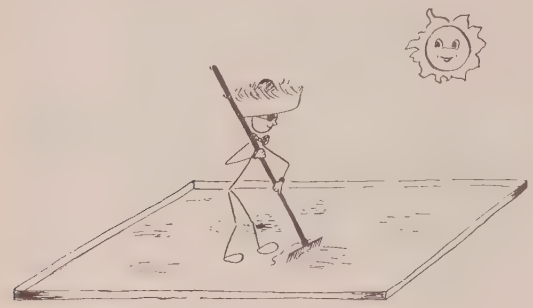
Winnowing a dirty sample

During winnowing, the material which blows away is the seed and some provision must be made to catch it. Cleaning may be carried out either before or after the sample has been dried. Very rubbishy samples may be cleaned both before and after drying.

DRYING

Once the sample has been harvested it should be dried as quickly as possible to

prevent seed deterioration. During hot weather this can be achieved by spreading the seed thinly on a shed floor and turning it to speed drying. Removal of green leaves or twigs by cleaning straight after harvesting facilitates drying.



Turning the seed to speed drying

On flowering bluebushes the whole flower ripens on the bush. Shaking of the bushes during harvesting results in a fair proportion of unripened and partly ripened flowers being included in the sample. These flowers ripen during the drying process and the following figures (see Table I) indicate that they germinate equally as well as seed which ripens on the bush.

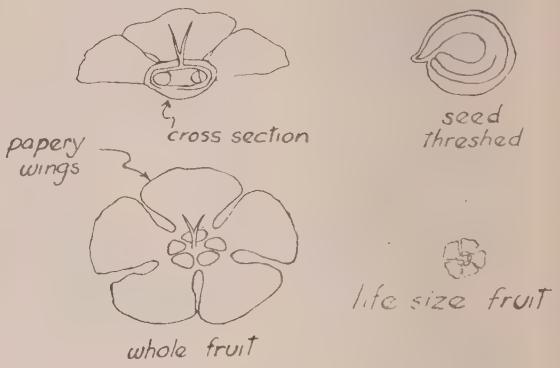
TABLE I

Type of Sample Prior to Drying	Per cent. Germination when Dried
Unripe	92
Half ripe	89
Ripe	90

The seed of bluebush when collected is enclosed in the ripened flower. The white or pink petals become dark brown and papery when dry and act as wings to allow the wind to carry the seeds easily. In this article the word "seed" rather incorrectly refers to the whole ripened flower.

STORING

Early experience showed that if good bluebush seed was kept in an open container in the laboratory its ability to germinate gradually decreased to nil at the end of 12 months. Tests showed the presence of a water soluble substance in the seed coverings which was detrimental to germination. This factor was suspected of possibly affecting seed storage. Testing indicated that keeping the seed very dry was a means of maintaining its viability.



Blue bush flowers and fruits

To emphasise the necessity for correct storage of bluebush seed the results of an experiment designed to discover the best method of storing will be of interest. In the experiment the following treatments were used:—

Seed Treatments.

(a) Whole seeds untreated.

(b) Whole seeds washed and dried rapidly.

(c) Seeds with wings, etc., removed (threshed seed).

Storage Conditions.

(1) Humidity 9% (relative humidity at 20° C.).

(2) Humidity 54% (relative humidity at 20° C.).

(3) Humidity 84% (relative humidity at 20° C.).

Some seed treated in each of the three ways was stored at each humidity. Germination tests were carried out over a period of two years.

The results as percent germination are summarised in Table II.

From the table it may be seen that humidity is the major factor affecting the storage of bluebush seed. If the seed is kept very dry it maintains its viability to about 60 per cent. of the initial level even after two years. If, on the other hand, the atmosphere is at all moist (54 per cent. relative humidity at 20° C.) the seed becomes useless after three months. Some

TABLE II

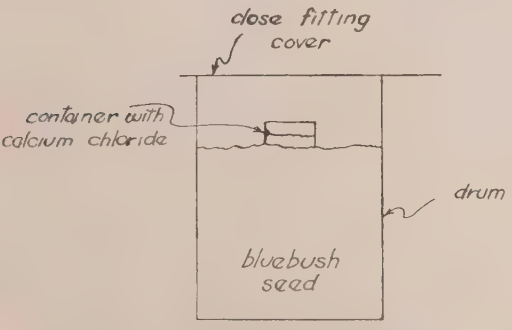
Time Stored, Months	Humidity per cent	Per cent. Germination		
		Seed Treatment		
		Nil	Washed	Threshed
0	9	49	56	54
12	....	45	36	28
24	....	31	21	13
0	54	59	51	54
1	....	35	13	37
3	....	0	0	1
0	84	59	54	65
1	....	33	6	32
3	....	0	0	3

slight benefit is indicated from threshing in the case of seed stored under moist conditions.

These studies indicate that the viability of bluebush seed can be maintained only if it is stored under particularly dry conditions. It should be mentioned that the seed used in this trial had already been stored over a drying agent for 4-5 months and may, therefore, have lost some freshness.

STORAGE METHOD

In order to keep bluebush seed sufficiently dry to maintain maximum viability it must be stored in a closed container in the presence of a drying agent. A suitable arrangement is shown in the following diagram. The drying agent recommended is calcium chloride. The commercial grade can be purchased for about 4s. 6d. per lb. from major chemical firms.



Storing seed with a drying agent

Let us follow the storage method step by step. Suppose we have a 44 gallon drum three-quarters full of bluebush seed. (Any fairly airtight container will be suitable). Place a pound of calcium chloride in an open tin on top of the bluebush seed. The tin should not be more than three-quarters full. Gradually the calcium chloride will take up water from the air in the drum and the bluebush seed will become progressively drier.

Eventually the calcium chloride will dissolve in the water it is absorbing and the tin will contain a concentrated solution of calcium chloride. Before all the calcium chloride has dissolved it should be removed from the drum and placed in its container in a moderate oven to dry out. The heat must be maintained for several hours for drying to occur. The dried calcium chloride should be allowed to cool down and then replaced on the bluebush seed.

The regeneration process may be repeated as often as necessary without spoiling the calcium chloride. Once a month may be sufficient but the actual time depends on the amount of seed, amount of calcium chloride, moisture content of the seed and the tightness of the cover on the drum. When not in use calcium chloride may be stored in a sealed container such as a screw-top jar.

If it is not possible to use the calcium chloride storage method, extreme care should be taken to clean out leaf matter from the seed sample, and to dry the sample very thoroughly. It may then be stored for a limited period in a cool dry place.

SUMMARY

(1) Newly collected bluebush seed should have as much rubbish as possible cleaned out of it by sieving and or winnowing.
(2) The seed should be dried out as thoroughly and rapidly as possible.
(3) The dried seed should be stored in a closed airtight container in the presence of a drying agent such as calcium chloride.
(4) The calcium chloride should be regenerated by drying it in an oven.

REFERENCES

Smith, S. T. and Malcolm, C. V., 1959, J. Agr. West. Aust., Vol., 8, 3rd Ser. No. 3, p. 263, Bull. No. 2630.

Malcolm, C. V., 1960, J. Agr. West Aust., Vol. 1, 4th Ser. No. 3, p. 263, Bull. No. 2732.

PLANNING A NEW FARM BUILDING?

Name the type and size of building you need . . .

LEAVE THE REST TO BOUCHERS

TO BOUCHERS INDUSTRIES LTD.
Scarborough Beach Rd., Osborne Park.
Please send details of .....
NAME .....
ADDRESS .....
.....

★ MACHINERY SHEDS
★ SHEARING SHEDS
★ HAY BARNS
★ VERMIN PROOF BARNS

ALL STEEL FRAMES

BOUCHER BUILDINGS Easy to erect ● Easy to extend ● Low prices due to standard components. Send coupon for details.

A Subsidiary Company of H. L. Brisbane and Wunderlich Ltd.

BOUCHERS INDUSTRIES LTD. Scarborough Beach Rd., Osborne Park.

PLANT DISEASES

SCLEROTINIA ROT OF VEGETABLES

By S. C. CHAMBERS, Plant Pathologist, and M. HARDIE, Vegetable Instructor

SCLEROTINIA ROT, caused by the fungus Sclerotinia sclerotiorum, is now one of the most serious vegetable diseases in metropolitan market gardens. Over the past decade it has been steadily increasing in prevalence and if present trends continue, many growers may be forced to abandon certain crops. Although most vegetables are susceptible, the greatest losses are occurring in the autumn planting of beans, cauliflowers and lettuce and in the production of cauliflower seed.

SYMPTOMS

Infection by the fungus may occur at any point on the above parts of the host plant, and is quickly followed by a soft, brownish rot. The affected tissue becomes covered with a whitish mould (Fig. 1) and as the disease progresses, black pebble-like bodies (sclerotia) are formed in this white growth. (Fig. 2.)

With cauliflowers and lettuce, infection usually occurs through injuries to the bases of stems or to the lower leaves. As the rot progresses, the leaves wilt in rapid succession until the plant has collapsed completely. Because of the typical way in which these plants collapse, the disease is often called "drop" (Fig. 3 and 4.)

In the case of cauliflowers grown for seed, the fungus frequently attacks flower stalks causing the flowers to wilt and die, so preventing seed formation.

Autumn bean crops appear to be most susceptible to this disease in the post flowering stage, infection often occurring through petals which have fallen on to healthy leaves and stems. When the fungus invades portion of a stem, the vine beyond the point of entry quickly wilts and dies (Fig. 5). These effects can be very serious if stems are attacked near ground level.

Fig. 1.—Bean pods (left) covered with whitish mould growth of *S. Sclerotiorum*
Healthy bean for comparison (right)

CARRY OVER AND SPREAD

The disease is carried over in the soil from one favourable crop period to the next by means of the black sclerotia. Those within 3 inches of the surface, germinate during the cool moist conditions of early May and form small mushroom-like structures which emerge from the soil (Fig. 6). Sclerotia buried at depths of more than 3 inches fail to produce these structures.

Fig. 2.—Head of cauliflower attacked by *S. Sclerotiorum* Note black pebble like bodies (Sclerotia) in white mould growth

The "mushrooms" produce thousands of tiny fungal seeds called spores, which are dispersed by the wind and spread the disease throughout the crop.

The disease is also perpetuated by means of its many alternate hosts. In Western Australia it has been recorded on beans, Brussel sprouts, cabbage, cauliflower, celery, lettuce, potato, red beet and tomato, as well as on certain weeds, ornamentals and pasture plants.

Fig. 3.—Field symptoms of lettuce "drop" caused by *S. Sclerotiorum*

Fig. 4.—Lettuce grown from the same crop as (Fig 3) showing collapse of lower leaves

REASONS FOR PREVALENCE

The increased incidence of Sclerotinia rot in recent years has been attributed to certain changes in market garden practice,* particularly—

(1) The abandonment of manual deep trenching due to labour costs.

Fig. 5.—A vine attacked at ground level

* W. P. Cass Smith. Private Communication

(2) Superseding of the plough by rotary hoe type implements which incorporate diseased residues in the surface soil.

(3) The system of marketing cauliflower curds and lettuce hearts without the outer leaves. This favours a rapid build-up of Sclerotinia rot in leaf residues.

(4) The shorter rotations, which have followed the general use of D-D fumigant for root knot control.

RECOMMENDATIONS FOR CONTROL

1. Deep burial of sclerotia. A modified method of trenching is being employed by some gardeners who claim it can be carried out for approximately £60 per acre. This method involves first opening a 17 inch furrow. The top 12 inches of one wall is then ploughed in and covered with 5 inches of soil from the bottom of the new furrow. The covering is dug by hand and represents a depth of one spade.

It is considered the benefits, resulting from reduction in weed growth and disease incidence, more than compensate for any temporary loss in fertility.

2. Wider spacing of plants and rows. This will allow greater circulation of air and so create environmental conditions less favourable to the disease.

3. Dusting with Penta-chloro-nitro-benzene (P.C.N.B.) at the rate of 30 lb. of active ingredient per acre may help to reduce the incidence of Sclerotinia. This should be applied at intervals of 14 days, the first application being made when the disease just becomes evident in the crop.

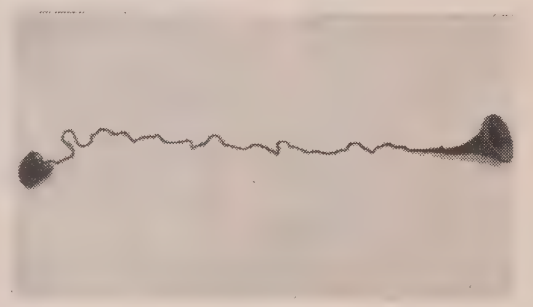


Fig. 6.—Small mushroom like structure (apothecium) arising from a Sclerotium of *S. Sclerotiorum*

SORGHUM ALMUM

Sorghum almum, sometimes known as Columbus grass, has been given considerable publicity in the rural Press, but farmers are warned to exercise caution in using this plant.

Sorghum almum is a perennial plant described as being suitable for grazing but, in the opinion of Department of Agriculture officers, it is unlikely that its productivity will be greater than that of the summer fodder crops already used in this State.

Like other sorghums, it is reputed to cause prussic acid poisoning of stock under certain conditions and its toxicity rating places it in a similiar range to Johnson grass which has been a prohibited plant in this State for many years.

Sorghum almum is a hybrid with Johnson grass as one of the parents and the seed cannot readily be distinguished from that of Johnson grass. It is feared that uncontrolled importation of the seed could result in Johnson grass becoming established here. Apart from its toxicity, Johnson grass is a perennial which spread by underground rhizomes, and farmers in the Eastern States have experienced great difficulty in eradicating this plant from their farms.

The sale of Sorghum almum seed in Queensland is banned and a prohibition was placed on the sale of seed in New South Wales. This was later lifted when it was found that many farmers had already sold seed privately to others.

As an inspection of seed imported into this State would not reveal whether it was the seed of Sorghum almum or Johnson grass, a ban on the importation of all but certified seed has been imposed, to ensure that only true-to-type seed will be made available to farmers.

Department of Agriculture officers have been instructed to make detailed surveys of areas sown to Sorghum almum in this State in order to collate as much information as possible concerning the growth of the plant in Western Australia.

ROGOR* 40

the safest systemic insecticide

Rogor 40 efficiently controls
European red mites,
Two-spotted mites,
byrobia and other mites
and suppresses second generation.

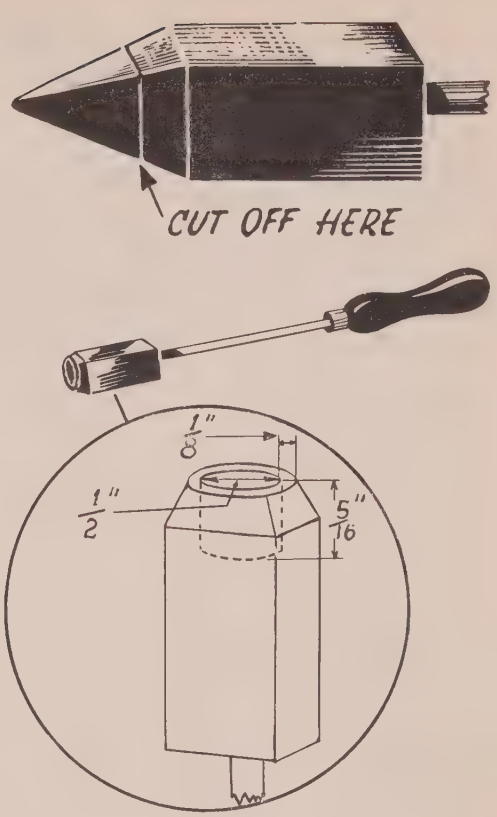
Rogor 40 also gives effective control of aphids,
fruit fly, mealybugs and scale insects.

For systemic protection with fewer applications . .
For an insecticide you can use nearer harvest
with greater safety . . . . **spray Rogor 40.**

Australian Distributors: Blyth Chemicals Ltd.
Prahran Grove, Elsternwick, Victoria.

FISONS CONTROL

Fig. 1.—Making a disbudding instrument from a soldering-iron. A portion of the tip is cut away, the corners are removed by filing and a half-inch hole is drilled in the centre



The DEHORNING of CATTLE

By J. SHILKIN, B.V.Sc., Assistant Chief Veterinary Surgeon

THE dehorning of cattle, both dairy and beef, has many advantages. Breeders of stud cattle frequently claim that removal of the horns spoils the appearance of show animals and stress that the practice is cruel. Whilst both these statements may, to some extent, be true, the advantages of the practice far outweigh any disadvantages.

Economic loss resulting from horn injury both in beef and dairy cattle is in the aggregate quite considerable. Bruising and other injuries during trucking and in yards, tearing and bruising of udders resulting in Mastitis, loss of milk production in timid cows, and dangerous bulls may all result from the policy of allowing animals to retain their horns.

Following the policy of dehorning large herds of dairy cattle the change in behaviour is quite marked and close concentration in holding yards and on small areas of pasture by means of electric fences is rendered much easier and less dangerous.

DEHORNING OF CALVES

The treatment of calves to prevent the growth of horns has much to recommend it and the method selected should become routine practice. When treated as calves, the animals suffer little or no check or discomfort from the operation.

Where possible they should be treated during the first ten days of life, but, in beef herds, where the stock may be mustered infrequently, more horn growth will occur and treatment may be carried out up to the age of 3 months.

The main methods recommended are:—

(1) Chemical.
(2) Cauterisation.
(3) Surgical.

1. Chemical Methods.

These should be used before the calves are 10 days to a fortnight old and the best preparation for the purpose is one contain-

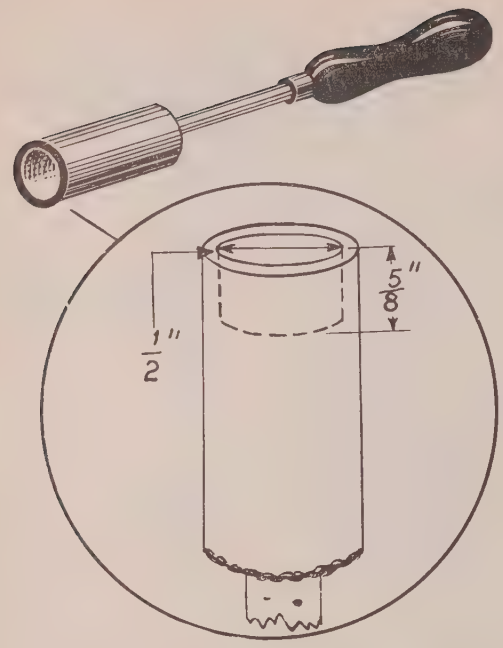


Fig. 2.—Copper or steel tubing made into a disbudding instrument

ing Antimony trichloride, the formula of which is—

	Per Cent.
Antimony trichloride	28
Salicylic acid	7
Flexible collodion	65

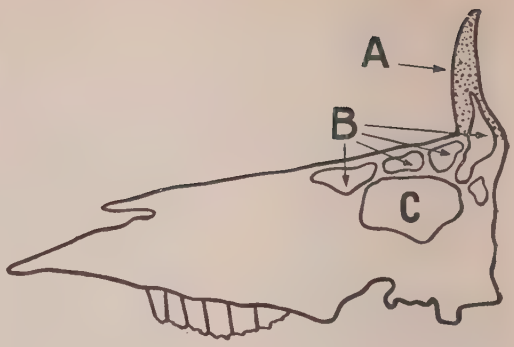


Fig. 3.—Cross-section of the skull of an ox showing A—Horn core; B—Frontal sinuses; C—Brain cavity

An area of about two inches across should be clipped over each horn bud and the skin over the bud thoroughly cleansed with methylated spirits. The skin area is then lightly rubbed with steel wool to produce an abrasion of the skin following which the preparation is applied with a brush working it in well to ensure contact with the skin. The collodion quickly forms a closely adhering film over the horn bud. As the mixture will solidify on exposure to air the bottle containing it should be kept firmly corked when not in use.

Caustic sticks are frequently used for the same purpose but have some disadvantages when compared with the previous method.

Clipping of the hair over the bud is carried out in the same manner and then

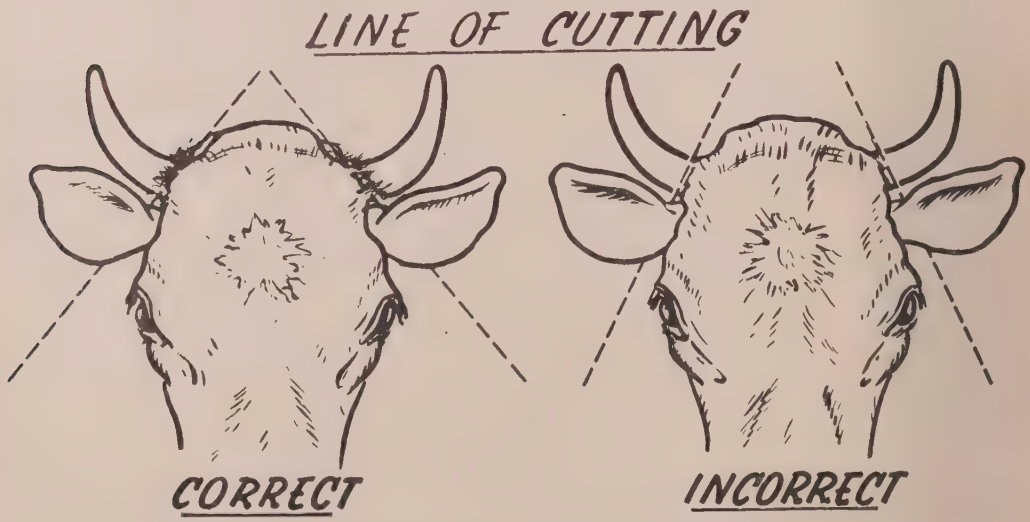


Fig. 4.—Correct and incorrect angles for operating the guillotine-type dehorner

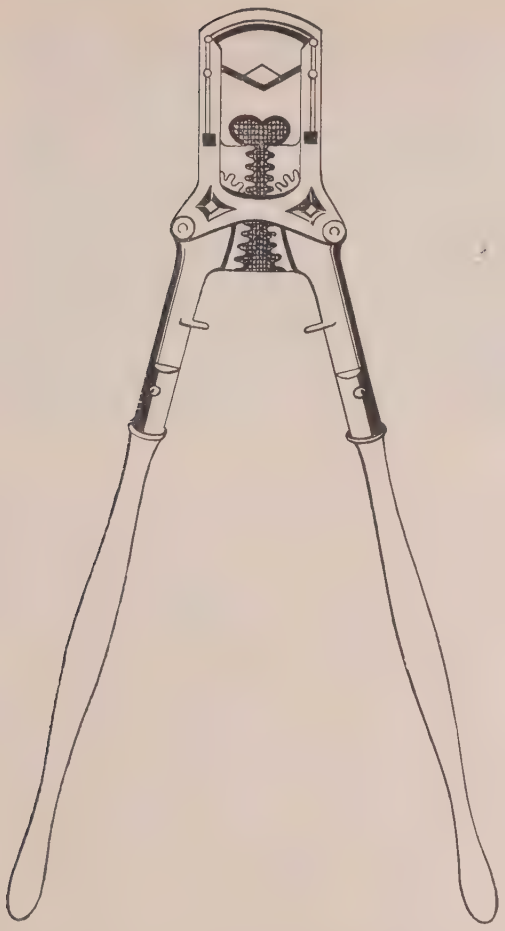


Fig. 5.—Guillotine-type dehorning instrument

vaseline is smeared around, but not on, the horn bud to prevent the caustic from spreading. One end of the caustic stick should be in a holder, wrapped in paper or held with rubber gloves to protect the fingers. The other end should then be moistened with water and rubbed over the horn bud till blood commences to ooze from the area.

Calves so treated should be tied up short for 5 or 6 hours in a dry place to prevent the caustic being smeared on to other parts of the body or on to other calves.

2. Cauterisation.

This method is also suitable only for very young calves. The purpose is to burn a groove around the tissues surrounding the horn bud so that further growth of horn is prevented.

There are special instruments available for this purpose, some being heated electrically and others in a fire. Each type, however, consists of a solid iron head with the end hollowed to form a dome-shaped depression half an inch across and five-sixteenths of an inch deep with the outer ring of metal one-eighth of an inch thick. An ordinary soldering iron may be readily adapted for the purpose. The iron is heated to a cherry red colour and applied firmly over the horn bud. Using a rotating movement a groove is then burned in the surrounding tissues. No further treatment is necessary.

3. Surgical Removal.

Up to the age of about three months the horn is attached only to the skin and it

Fig. 6.—Showing bail, rope for breeching, and dehorning in operation

Fig. 7.—One handle of the dehorner rests against the operator's thighs so that both hands may be used to close the handles and sever the horn

may be easily removed by special debudding scissors or a sharp knife.

DEHORNING ADULT CATTLE

The dehorning of adult cattle is quite widely practised in the dairying areas of the State but, as has been previously mentioned the routine treatment should be that of the calves and not the adult cattle. However, in many cases herds must be treated initially and in some areas horned animals are frequently introduced into dehorned herds.

The consequences of dehorning adult cattle are feared by some owners but if the correct instruments are used, restraint adequate and the operation carried out quickly in the recommended manner, any pain resulting from dehorning will be reduced to a minimum and little if any reduction in milk production or condition of the animals will result.

Various dehorning instruments are on the market but only those which are massive in type and which enable the horns to be removed cleanly and quickly should be used. Where instruments are faulty and several attempts are necessary before the horn is removed, unnecessary pain is caused.

A good crush with an ordinary sword stick bail at the end is desirable and a stout post so placed that the animal's head can be drawn through and tied securely to one side is an advantage. Ordinary milking bails are sometimes used for the purpose but for obvious reasons it is preferable to avoid their use wherever possible.

Once the animal is restrained the dehorners are adjusted over the horn so as to include a narrow circular strip of skin around the base of the horn. Two men may work the handles of the dehorner, that is, one on each handle, but in any case the horns should be snapped off with one swift blow.

Blood spurts from the arteries, often in quite large streams, but as this usually ceases quickly, little notice should be taken of it. However, it is preferable to release the cattle into a small yard or paddock so that they can be examined twenty minutes to half an hour after the removal of the horns. Where bleeding is still severe after this time it may be controlled by applying a ligature in the form of a cord tied around the base of the horns and

Fig. 8.—Ligature in position

drawn across the top of the head and then twitched tightly by drawing the two pieces of cord together across the top of the poll. The cord should be removed in about half an hour.

Prior to use the dehorning instruments should be soaked overnight in a strong solution of disinfectant such as 10 per cent. lysol and whilst dehorning should be placed in a bucket of dilute disinfectant such as 2 per cent. lysol when not in use.

After-treatment of dehorned cattle is not usually necessary nor desirable. Dressings applied to the wound may get into the frontal sinus and produce an inflammatory condition. However, where flies are likely to be bad, it may be good practice to apply a suitable fly repellant around but not over the treated area. There are a number of fly repellants available which are primarily used as sheep dressings, but which, however, are quite suitable for this purpose in cattle.

DEHORNING OF BULLS

The large horns of some bulls may be difficult to remove with the dehorner and considerable pain may be caused in attempting to do so. It is preferable, therefore, when possible, to have the operation carried out under a local anaesthetic by a veterinarian.

TAPEWORM IN SHEEP

Infestations with *Cysticercus ovis* have again been reported in lambs slaughtered for export. During the past three years this parasite has been responsible for the rejection of more than 1,000 lambs at the W.A. Meat Export Works alone, and although the export season has only just begun 20 rejections have already been necessary.

C. ovis is the intermediate stage of a large tapeworm (*Taenia ovis)* which inhabits the intestinal tract of the dog. Infested dogs pass out the eggs in their droppings. These are swallowed by the lambs while grazing, and upon reaching the intestines the shells are digested and minute embryos emerge which bore through the bowel wall and are carried via the blood stream to muscles where they become lodged and give rise to tapeworm cysts. Dogs become infested by eating raw offal containing these cysts.

C. ovis is found in the heart muscle and diaphragm and sometimes in the tongue but in heavy infestations the cysts may be present through the skeletal muscles. These cysts are oval and about a quarter of an inch in diameter, but when they degenerate, as commonly occurs, they shrink to hard white nodules about the size of a grain of wheat.

For the protection of lambs against infestation the following precautions are necessary:—

(1) Do not feed raw offal particularly hearts and diaphragms (skirts) to dogs. Boiling for 10 minutes will destroy the cysts.

(2) Treat all farm dogs at least twice yearly to free them of the adult tapeworms. Arecoline hydrobromide which is highly effective is recommended for this purpose. It is available in ½-grain tablets and the dosage is as follows:—Kangaroo dogs 1 grain, sheep dogs ½-grain, terriers and small dogs ¼-grain.

Foxes, wild dogs and dingoes may also harbour the tapeworms, and in areas where these animals are prevalent, control measures are unlikely to prove very effective but there can be little doubt that on many properties the incidence of *C. ovis* could be greatly reduced or perhaps eliminated by the adoption of these precautions.

THE CALUMET

To the early American pioneers, the symbol of peace and friendship was the CALUMET—the name given by the French in Canada to the "Peace Pipe" of the American Indians. With a bowl of soft red stone and a long reed for a stem, the CALUMET is usually decorated with eagle quills or hair and is smoked on all important and ceremonial occasions. Although its special function was at the making of Treaties of Peace, the CALUMET has also been smoked between the chiefs of uniting tribes in their wars against the early white settlers. However, the offering of the CALUMET is a supreme proof of hospitality and this significant tradition is still practised today. In Australia, Elders have for over 120 years, symbolised the tradition of service to the man on the land and at all times offered specialised assistance in all matters relating to Stock, Wool, Land, Insurance, Merchandise or Travel.

BECAUSE OF THIS TRADITION OF SERVICE

YOU CAN ALWAYS RELY ON . . . .

Elders

List of REGISTERED FERTILISERS

By H. G. CARISS, B.Sc. (Agric.), Inspector of Fertilisers

IN accordance with the provisions of the Fertilisers Act, 1928-1955, it is required that—with the exception of bulk sales to a manufacturer and those made in accordance with a buyer's written prescription—all fertilisers sold are required to be registered annually, the registration year being from November 1 to October 31 following. The list of fertilisers registered for the year commencing November 1, 1960, is set out herewith in tabular form.

Under the provisions of the Act, not only must all fertilisers sold in this State be registered, but they must carry a registered brand and be contained in a package which is conspicuously marked, or to which is attached a label conspicuously marked with a copy of the registered brand and the name of the fertiliser.

Further, in an amendment to the Act made in 1955 it was prescribed that in the case of quantities less than 1 cwt. the package or label must in addition carry particulars of the name and place of business of the manufacturer or importer together with the registered analysis and as set out in the prescribed application form for registration.

The 1955 amendment of the Act also, *inter alia,* amended the definition of a "fertiliser" and "specified ingredient" to include specific minor elements such as copper, zinc, manganese and molybdenum, etc. Lime, lime compounds and gypsum are fertilisers within the Act. The Act also provides that on the sale of any fertiliser an invoice shall be given and in the case of packages of 1 cwt. or more details of the specified ingredients as registered must be given.

Inspectors are appointed under the Act and periodical inspections of places where fertilisers are kept for sale are made and samples taken and submitted to the Government Laboratories for analysis. Where any discrepancies occur, appropriate action is taken. Manufacturers, as a rule, aim at maintaining the analysis of their various fertilisers and fertiliser mixtures as close to the guaranteed figures as possible.

Periodically, new fertiliser mixtures appear on the market, some of which are alleged to be a complete solution to optimum plant growth. Such fertilisers should be treated with caution as analysis could reveal them to be near worthless and certainly far more costly than their ingredients would justify. Before purchasing it is suggested that the Department of Agriculture be contacted and information sought as to their registered analyses and comparable values.

A simple guide to purchasing fertilisers and manures is the use of unit values. The system of units and unit values enables an approximation to be made of the comparative values of similar fertilisers. At first glance it could appear that the quoted costs per ton of a certain type of fertiliser produced by one manufacturer could be most satisfactory but a comparison on a unit value basis could show that this was not so.

The amount of each ingredient in a fertiliser, e.g., nitrogen in sulphate of ammonia, is measured in terms of units, 1 unit being 1 per cent. by weight per ton. Therefore, the unit value for nitrogen in

sulphate of ammonia containing 20 per cent. N and costing £37 per ton would be 37s. Similarly, unit values for nitrogen as blood and bone or urea, phosphoric anhydride in water soluble and other forms and either inorganic as super or organic in blood and bone or bone dust can be obtained.

The unit values calculated from the current year's registrations as at November 1st 1960, are set out below.

Nitrogen (N) as:—

	s.	d.
Blood, Blood and Bone, Bone Dust and other animal fertilisers	81	6
Nitrate	43	5
Ammonia	29	0
Urea	30	2

Phosphoric Anhydride (P_2O_5) as:—

Water soluble in superphosphate	10	11
Citrate soluble in superphosphate	10	11
Acid soluble in superphosphate and rock phosphate	6	5
Blood and Bone, Bone Dust and other animal fertilisers	20	2

Potash (K_2O) as:—

Sulphate	16	0½
Muriate (Chloride)	11	0

These average unit values keep closely to the fertilising value, but it should be clearly understood that they are not a definite value as they are governed by current rates. However, the total of the individual unit values in each and every fertiliser is not necessarily the same as the quoted price, as the calculated values are only averages for all fertilisers of that type registered.

With mixed mineral fertilisers, viz. Potato Manures, etc., the extra costs of mixing and handling must be added to the cost of the ingredients. Though mixing costs vary with the actual mixture the unit values can still serve as a guide to the relative values of the different mixtures for any specific purpose.

To illustrate this comparison by unit values a simple example using two samples of blood and bone of different composition will serve.

	Nitrogen.	Phosphoric Anhydride.
	%	%
X Brand Blood and Bone	6.5	10.0
Y Brand Blood and Bone	5.5	13.0

From the table of unit values for the current fertiliser year it will be noted that value for nitrogen in blood and bone is 81s. 6d. and for phosphoric anhydride 20s. 2d. Using these figures the compared value for each brand is:—

X Brand Blood and Bone.

	£	s.	d.
6.5 units of nitrogen @ 81s. 6d. per unit	26	9	9
10.0 units of phosphoric anhydride @ 20s. 2d. per unit	10	3	4
Total value	£36	13	1

Y Brand Blood and Bone.

	£	s.	d.
5.5 units of nitrogen @ 81s. 6d. per unit	22	8	3
13.0 units of phosphoric anhydride @ 20s. 2d. per unit	13	4	4
Total value	£35	12	7

It will be seen, therefore, from this comparison that the units in X brand are worth more than Y brand and therefore the former would be the more economical fertiliser to purchase when both are priced at £30. Unit values should only be used for comparing fertilisers of similar types. Inorganic fertilisers such as nitrate of soda or sulphate of ammonia should not be compared with blood and bone as a source of nitrogen.

When in doubt about the value of a fertiliser being marketed, intending buyers are strongly recommended to make inquiries at the Department of Agriculture before making any purchases. Full information on the provisions and requirements of the Fertilisers Act, 1928-1955, can be obtained and in addition technical advice is available concerning the use of fertiliser, whether it be for general agriculture, commercial or home gardening.

Fertilisers registered under the FERTILISERS ACT, 1928-1955 for the year commencing November 1st, 1960

Name of Fertiliser	Reg. No.	Registered Brand	By Whom Registered	Nitrogen (N) as				Phosphoric Anhydride (P_2O_5) as				Potash (K_2O) as		Cash Price per ton at Works (W) or on Rails at Perth (P)*
				Nitrate	Ammonia	Blood and Bone	Urea	Water Soluble	Citrate Soluble	Acid Soluble	Total	Sulphate	Muriate	
				%	%	%	%	%	%	%	%	%	%	
A. MINERAL														
1. Nitrogenous—														
(a) *Nitrogen as Nitrate*														Packets
Nitrate of Soda	14	Symonds....	E. Symonds & Co.	16·0	....	....	....	....	....	....	....	....	....	£36/0/0 (P)
C.A.N. Calcium Ammonium Nitrate	23	Wesfarmers	Westralian Farmers Co-op. Ltd.	10·25	10·25	37·5%	$CaCo_3$	....	....	....	....	....	....	
Nitrate of Soda	27	do.	do. do. do.	16·0	....	....	....	....	....	....	....	....	....	Packets
Sodium Nitrate	80	Blue Cross	Agricultural Products Co.	15·0	....	....	....	....	....	....	....	....	....	Packets
Nitrate of Soda	186	C.S.M.L. in diamond	Cuming Smith & Mt. Lyell Farmers Fertilisers Ltd.	16·0	....	....	....	....	....	....	....	....	....	£37/10/0 (PW)
														£39/15/0 (BW)
Nitrate of Soda	204	David Grays	David Gray & Co. Ltd	16·0	....	....	....	....	....	....	....	....	....	Packets
Ammonium Nitrate	213	Faulding....	F. H. Faulding & Co. Ltd.	30·0	....	....	....	....	....	....	....	....	....	£6/1/4 cwt.
Sodium Nitrate	214	do.	do. do. do.	16·0	....	....	....	....	....	....	....	....	....	£8/8/0 cwt.
Nitrate of Soda	257	Champion	Chilean Nitrate Sales Corporation Pty. Ltd.	16·0	....	....	....	....	....	....	....	....	....	£32/0/0 (P)
Calcium Ammonium Nitrate (C.A.N.)	289	Swift	Swift & Co. Ltd.	10·25	10·25	36·5	CaO	....	....	....	....	....	....	£36/0/0 (P)
(b) *Nitrogen as Ammonia*														Packets
Sulphate of Ammonia	11	Symonds	E. Symonds & Co.	....	20·5	....	....	....	....	....	....	....	....	Packets
Do. do.	26	Wesfarmers	Westralian Farmers Co-op. Ltd.	....	20·5	....	....	....	....	....	....	....	....	
														Packets
Do. do.	100	Blue Cross	Agricultural Products Co.	....	20·5	....	....	....	....	....	....	....	....	£29/15/0 (PW)
Do. do.	193	Lightning	Cuming Smith & Mt. Lyell Farmers Fertilisers Ltd.	....	20·5	....	....	....	....	....	....	....	....	£32/10/0 (GW)
														£30/5/0 (BW)
														£32/10/0 (AW)
														Packets
Do. do.	205	David Grays	David Gray & Co. Ltd.	....	20·5	....	....	....	....	....	....	....	....	£2/11/6 cwt.
Do. do. ..	212	Faulding	F. H. Faulding & Co. Ltd.	....	20·0	....	....	....	....	....	....	....	....	Packets
Do. do.	228	Boans Ltd.	Boans Ltd.	....	20·5	....	....	....	....	....	....	....	....	Packets
Do. do.	262	Evergreen Fertilisers	Voldemars Ertners	....	20·5	....	....	....	....	....	....	....	....	
Do. do.	287	Swift	Swift & Co. Ltd.	....	20·5	....	....	....	....	....	....	....	....	£37/0/0 (P)
(c) *Nitrogen as Urea*														
Urea	17	Swallow	Westralian Farmers Co-op. Ltd.	....	....	....	46·0	....	....	....	....	....	....	£69/17/6 (P)
Urea 46%	42	BASF	Henry H. York & Co .Pty. Ltd.	....	....	....	46·0	....	....	....	....	....	....	£75/0/0 (P)
UF 38	44	George Warners	George C. Warner Laboratories	....	....	....	38·0	....	....	....	....	....	....	Packets
														Packets
Urea—N45	99	Blue Cross	Agricultural Products Co.	....	....	....	45·0	....	....	....	....	....	....	£66/0/0 (PW)
Urea	184	C.S.M.L. in Diamond	Cuming Smith & Mt. Lyell Farmers Fertilisers Ltd.	....	....	....	46·0	....	....	....	....	....	....	£67/0/0 (BW)
														Packets
Do.	206	David Grays	David Gray & Co. Ltd.	....	....	....	46·0	....	....	....	....	....	....	Packets
Urea Pink	221	Pesticides	Wilcox Mofflin Ltd.	....	....	....	45·0	....	....	....	....	....	....	Packets
Instant Lawn Green	231	Jaymar	Boans Ltd	....	....	....	46·0	....	....	....	....	....	....	£66/17/6 ton
Urea 46%	247	Lanes	Lanes (W.A.) Pty. Ltd.	....	....	....	46·0	....	....	....	....	....	....	£3/12/6 cwt.
Urea	288	Swift	Swift & Co. Ltd.	....	....	....	46·0	....	....	....	....	....	....	£75/0/0 (P)
2. Phosphatic—														
(a) *Rock Phosphate*														
Ground Phosphate Rock	54	Cresco	Cresco Fertilisers (W.A.) Ltd.	....	....	....	....	....	....	36·6	36·6	....	....	£11/15/0 (W)
Do. do. do.	106	A in diamond	Albany Superphosphate Co. Pty. Ltd.	....	....	....	....	....	....	36·6	36·6	....	....	£11/15/0 (W)
Do. do. do.	130	Sickle	Cuming Smith & Mt. Lyell Farmers Fertilisers Ltd.	....	....	....	....	....	....	36·6	36·6	....	....	£11/15/0 (W)

(BW) Bunbury Works. (PW) Perth Works. (AW) Albany Works. (GW) Geraldton Works. (PJW) Picton Junction Works).

FERTILISERS—continued

Name of Fertiliser	Reg. No.	Registered Brand	By Whom Registered	Nitrogen (N) as				Phosphoric Anhydride (P_2O_5) as				Potash (K_2O) as		Cash Price per ton at Works (W) or on Rails at Perth (P)*
				Nitrate	Ammonia	Blood and Bone	Urea	Water Soluble	Citrate Soluble	Acid Soluble	Total	Sulphate	Muriate	
				%	%	%	%	%	%	%	%	%	%	
A. MINERAL—*contd.*														
2. Phosphatic—*contd.*														
(a) *Rack Phasphate* cont														
Ground Pdosphate Rock	149	ML in diamond	Cuming Smith & Mt. Lyell Farmers Fertilisers Ltd.	....	....	....	....	....	....	36·6	36·6	....	....	£11/15/0 (W)
Do. do. do.	163	CSML in diamond	do. do. do.	....	....	....	....	....	....	36·6	36·6	....	....	£11/15/0 (W)
(b) *Superphosphate*														
Superphosphate	8	Symonds....	E. Symonds & Co.	....	....	....	....	17·0	3·0	3·0	23·0	....	....	Packets
Do.	22	Wesfarmers	Westralian Farmers Co-op. Ltd.	....	....	....	....	17·0	3·0	3·0	23·0	....	....	Packets
Do. 23%	552	Cresco	Cresco Fertilisers (W.A.) Ltd.	....	....	....	....	17·0	3·0	3·0	23·0	....	....	£11/17/0 (W)
Do.	101	Blue Cross	Agricultural Products Co.	....	....	....	....	17·0	3·0	3·0	23·0	....	....	Packets
Do. 23%	105	A in diamond	Albany Superphosphate Co. Pty. Ltd.	....	....	....	....	17·0	3·0	3·0	23·0	....	....	£11/17/0 (W)
Do. 23%	129	Sickle in diamond	Cuming Smith & Mt. Lyell Farmers Fertilisers Ltd.	....	....	....	....	17·0	3·0	3·0	23·0	....	....	£11/17/0 (W)
Do. 23%	148	ML in diamond	do. do. do.	....	....	....	....	17·0	3·0	3·0	23·0	....	....	£11/17/0 (W)
Do. 23%	162	CSML in diamond	do. do. do.	....	....	....	....	17·0	3·0	3·0	23·0	....	....	£11/17/0 (W)
Do.	201	David Grays	David Gray & Co. Ltd.	....	....	....	....	17·0	3·0	3·0	23·0	....	....	Packets
Do.	227	Boans	Boans Ltd.	....	....	....	....	17·0	3·0	3·0	23·0	....	....	Packets
(c) *Rock Phosphate and Superphosphate*														
50/50 Mixture	53	Cresco	Cresco Fertilisers (W.A.) Ltd.	....	....	....	....	8·5	1·5	20·0	30·0	....	....	£12/11/0 (PW)
Do.	107	A in diamond	Albany Superphosphate Co. Pty. Ltd.	....	....	....	....	8·5	1·5	20·0	30·0	....	....	£12/11/0 (AW)
Do.	131	Sickle in diamond	Cuming Smith & Mt. Lyell Farmers Fertilisers Ltd.	....	....	....	....	8·5	1·5	20·0	30·0	....	....	£12/11/0 (PW)
Do.	150	ML in diamond	do. do. do.	....	....	....	....	8·5	1·5	20·0	30·0	....	....	£12/11/0 (PW)
Do.	164	CSML in diamond	do. do. do.	....	....	....	....	8·5	1·5	20·0	30·0	....	....	£12/11/0 (PJW)
3. Potassic—														
(a) *Potash as Muriate*														
Muriate of Potash	12	Symonds....	E. Symonds & Co.	....	....	....	....	....	....	....	....	....	58·0	Packets
Do. do.	23	Wesfarmers	Westralian Farmers Co-op. Ltd.	....	....	....	....	....	....	....	....	....	58·0	Packets
Do. do.	98	Blue Cross	Agricultural Products Co.	....	....	....	....	....	....	....	....	....	58·0	Packets
Do. do.	194	Sun	Cuming Smith & Mt. Lyell Farmers Fertilisers Ltd.	....	....	....	....	....	....	....	....	....	58·0	Jute Bags— £32/0/0 (PW) £33/0/0 (BW (AW) Paper bags— £30/15/0 (PW) £31/5/0 (BW) (AW)
Do. do.	203	David Grays	David Gray & Co. Ltd.	....	....	....	....	....	....	....	....	....	58·0	Packets
Do. do.	229	Boans	Boans Ltd.	....	....	....	....	....	....	....	....	....	58·0	Packets
Do. do.	258	Evergreen Fertilisers	Voldemars Ertners	....	....	....	....	....	....	....	....	....	58·0	Packets

(b) *Potash as Sulphate*															
Sulphate of Potash	13	Symonds....	E. Symonds & Co.	....	....	....	....	....	....	....	....	48·0	....	Packets
Do. do.	29	Wesfarmers	Westralian Farmers Co-op. Ltd.	....	....	....	....	....	....	....	....	48·0	....	Packets
Do. do.	195	Sun	Cuming Smith & Mt. Lyell Farmers Fertilisers Ltd.	....	....	....	....	....	....	....	....	48·0	....	Jute Bags— £38/10/0 (PW) £40/10/0 (GW) £39/5/0 (BW) £40/5/0 (AW) Paper Bags— £36/10/0 (PW) £38/10/0 (GW) (AW) £37/5/0 (BW)
Do. do.	202	David Grays	David Gray & Co. Ltd.	....	....	....	....	....	....	....	....	48·0	....	Packets
4. Nitrogen and Phosphoric Anhydride—															
Garden Fertiliser	50	Sound	Cockburn Sound Fertilisers Pty. Ltd.			4·0			3·0	1·0	2·0	6·0	....	....	£25
Potato Manure C	68	Cresco	Cresco Fertilisers (W.A.) Ltd.	....	3·5	....	....	14·0	2·5	2·25	18·75	....	....	£17/15/6 (PW)
Do. do.	119	A in diamond	Albany Superphosphate Co. Pty. Ltd.	....	3·5	....	....	14·0	2·5	2·25	18·75	....	....	£18/5/0 (AW)
Do. do.	143	Sickle in diamond	Cuming Smith & Mt. Lyell Farmers Fertilisers Ltd.	....	3·5	....	....	14·0	2·5	2·25	18·75	....	....	£17/15/6 (PW)
Do. do.	157	ML in diamond	do. do. do.	....	3·5	....	....	14·0	2·5	2·25	18·75	....	....	£17/15/6 (PW)
Do. do.	176	CSML in diamond	do. do. do.	....	3·5	....	....	14·0	2·5	2·25	18·75	....	....	£17/17/0 (PJW) £18/5/0 (GW)
Super and Ammonia (2 : 1)	281	A in diamond	Albany Superphosphate Co. Pty. Ltd.	....	6·5	....	....	11·0	2·0	2·0	15·0	....	....	£22/8/0 (AW)
Do. do.	282	Sickle in diamond	Cuming Smith & Mt. Lyell Farmers Fertilisers Ltd.	....	6·5	....	....	11·0	2·0	2·0	15·0	....	....	£21/9/6 (W)
Do. do.	283	ML in diamond	do. do. do.	....	6·5	....	....	11·0	2·0	2·0	15·0	....	....	£21/9/6 (W)
Do. do.	284	CSML in diamond	do. do. do.	....	6·5	....	....	11·0	2·0	2·0	15·0	....	....	£21/13/0 (PJW) £22/8/0 (GW)
5. Nitrogen, Phosphoric Anhydride and Potash—															
Rose Fertiliser	6	Symonds.	E. Symonds & Co.	....	4·25	....	....	4·0	3·5	4·5	12·0	....	3·75	Packets
Lawn Fertiliser	7	do.	do. do. do.	....	4·25	....	....	4·0	3·5	4·5	12·0	....	3·75	Packets
Potato Manure "B"	9	do.	do. do. do.	....	3·5	....	....	12·5	2·0	2·25	16·75	....	5·0	Packets
Do. do. "E"	10	do.	do. do. do.	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	Packets
Complete Red	24	Wesfarmers	Westralian Farmers Co-op. Ltd.	0·6 as Ammonium Nitrate 5·4 as Potassium Nitrate 1·6 as Mono/Diammonium phosphate 5·4 as Ammonium Chloride			....	5·4 as Mono/Diammonium Phosphate 7·6 as Dicalcium Phosphate				19·1 as Potassium Nitrate 1·9 as Potassium Chloride		£53/18/6 (PW) (P)
Potato Manure "E"	30	Wesfarmers	do. do. do.	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	Packets
Gard-N-Tabs	43	George Warners	George C. Warner Laboratories Pty. Ltd.	....	14·0	....	....	19·0	....	....	19·0	24·0 as Nitrate		Packets
Foli-8	45	do.	do. do. do.	....	20·0	....	....	20·0	....	....	20·0	20·0 as Nitrate		Packets
Harold Darke Special Fertiliser	46	do.	do. do. do.	22·0 as Urea and Ammonia				10·0	....	....	10·0	21·0 as Nitrate		Packets
Top Dressing Fertiliser	47	P.P.	Picton Produce Pty. Ltd.	....	2·75	....	....	7·5	....	14·0	21·5	....	2·0	£26/0/0 (PJW)
Potato Manure "A"	66	Cresco	Cresco Fertilisers (W.A.) Ltd.	....	2·5	....	....	13·25	2·25	2·5	18·0	....	5·0	£18/12/6 (PW)
Do. do. "B"	67	do.	do. do. do.	....	3·5	....	....	12·5	2·0	2·25	16·75	....	5·0	£19/11/6 (PW)
Do. do. "E"	69	do.	do. do. do.	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	£20/13/6 (PW)
Orchard Manure	70	do.	do. do. do.	....	3·5	....	....	12·5	2·0	2·25	16·75	....	5·0	£19/11/6 (PW)
N.P.K. 9 : 9 : 9	72	do.	do. do. do.	....	9·0	....	....	6·0	1·5	1·5	9·0	....	9·0	£25/15/0 (PW)
Potato Manure "A"	74	Blue Cross	Agricultural Products Co.	....	2·5	....	....	13·25	2·25	2·5	18·0	....	5·0	Packets
Do. do. "E"	75	do.	do. do. do.	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	Packets
Bulb-O	87	do.	do. do. do.	....	....	2·25	....	3·0	3·5	3·5	10·0	....	4·5	Packets
Special Garden Fertiliser	95	do.	do. do. do.	....	4·0		....	3·0	3·0	6·0	12·0	2·5	....	Packets
Potato Manure "A" ...	117	A in diamond	Albany Superphosphate Co. Pty. Ltd.	....	2·5	....	....	13·25	2·25	2·5	18·0	....	5·0	£19/1/6 (AW)

(BW) Bunbury Works. (PW) Perth Works. (AW) Albany Works. (GW) Geraldton Works. (PJW) Picton Junction Works.

Name of Fertiliser	Reg. No.	Registered Brand	By Whom Registered	Nitrogen (N) as				Phosphoric Anhydride (P_2O_5) as				Potash (K_2O) as		Cash Price per ton at Works (W) or on Rails at Perth (P)*
				Nitrate	Ammonia	Blood and Bone	Urea	Water Soluble	Citrate Soluble	Acid Soluble	Total	Sulphate	Muriate	
A. MINERAL—*con.*				%	%	%	%	%	%	%	%	%		
5. Nitrogen, Phosphoric Anhydride and Potash—*continued*														
Potato Manure "B"	118	A in Diamond	Albany Superphosphate Co. Pty. Ltd.	....	3·5	....	....	12·5	2·0	2·25	16·75	....	5·0	£20/3/0 (AW)
Do. do. "E"	120	do.	do. do. do.	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	£21/6/0 (AW)
Orchard Manure	121	do.	do. do. do.	....	3·5	....	....	12·5	2·0	2·25	16·75	....	5·0	£20/3/0 (AW)
Garden Fertiliser	122	do	do. do. do.	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	£21/6/0 (AW)
Potato Manure "A"	141	Sickle in diamond	Cuming Smith & Mt. Lyell Farmers Fertilisers Ltd.	....	2·5	....	....	13·25	2·25	2·5	18·0	....	5·0	£18/12/6 (PW)
Do. do. "B"	142	do.	do. do. do.	....	3·5	....	....	12·5	2·0	2·25	16·75	....	5·0	£19/11/6 (PW)
Do. do. "E"	144	do.	do. do. do.	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	£20/13/6 (PW)
Orchard Manure	145	do.	do. do. do.	....	3·5	....	....	12·5	2·0	2·25	16·75	....	5·0	£19/11/6 (PW)
Garden Fertiliser	146	do.	do. do. do.	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	£20/13/6 (PW)
Potato Manure "A"	155	ML in diamond	do. do. do.	....	2·5	....	....	13·25	2·25	2·5	18·0	....	5·0	£18/12/6 (PW)
Do. do. "B"	156	do.	do. do. do.	....	3·5	....	....	12·5	2·0	2·25	16·75	....	5·0	£19/11/6 (PW)
Do. do. "E"	158	do.	do. do. do.	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	£20/13/6 (PW)
Garden Fertiliser	160	do.	do. do. do.	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	£20/13/6 (PW)
Potato Manure "A"	174	CSML in diamond	do. do. do.	....	2·5	..	..	13·25	2·25	2·5	18·0		5·0	£18/15/6 (PJW)
Do. do. "B"	175	do.	do. do. do.	....	3·5	....	....	12·5	2·0	2·25	16·75	....	5·0	£19/15/0 (PJW)
Do. do. "E"	177	do.	do. do. do.	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	£20/18/0 (PJW)
Do. do. "E2"	178	do.	do. do. do.	....	3·5	....	....	11·5	2·0	2·0	15·5	8·0	....	£23/6/0 (GW)
Orchard Manure	179	do.	do. do. do.	....	3·5	....	....	12·5	2·0	2·25	16·75	....	5·0	£19/15/0 (PJW)
Garden Fertiliser	180	do.	do. do. do.	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	£20/18/0 (PJW)
Tobacco Fertiliser	181	do.	do. do. do.	....	3·0	....	....	8·25	1·5	1·5	11·25	15·0	....	£27/0/6 (PJW)
Tomato Manure	183	do.	do. do. do.	....	3·5	....	....	10·25	1·5	2·0	13·75	10·0	....	£24/13/0 (GW)
N.P.K. 13 : 13 : 20	185	do.	do. do. do.	5·7	7·3	....	....	5·0	8·0	....	13·0	....	20·0	£51/10/0 (PW) (Bunbury)
Potato Manure "E"	198	David Grays	David Gray & Co. Ltd.	....	3·5	....	....	11·5	2·0	2·0	15·5	..	8·0	Packets
New Special All Purpose Garden Food	223	Boans	Boans Ltd.	....	4·0			2·0	2·0	4·0	8·0	3·0		Packets
Potato "E"	230	do.	do.	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	Packets
Boosterop "Antifly"	245	Blue Cross	Agricultural Products Co.	....	4·0 as Ammonia and Urea			1·0	3·0	5·0	9·0	3·0	....	Packets (plus ·03 Gamma Isomer B.H.C.)
No. 1 Fertiliser	253	Apex	E. J. Fry Pty. Ltd.	....	5·0		....	3·0	1·5	4·5	9·0	....	2·0	£37/0/0 (P)
Lawn Fertiliser	254	do.	do. do.	....	5·0		....	3·0	1·5	4·5	9·0	....	2·0	£37/0/0 (P)
Potato Manure "E"	259	Evergreen Fertilisers	Voldemars Ertners	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	Packets
Garden Manure	263	do.	do. do.	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	Packets
Lawn Manure	264	do.	do. do.	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	Packets
6. Phosphoric Anhydride and Potash—														
Super and Potash	61	Cresco	Cresco Fertilisers (W.A.) Ltd.	....	....	....	....	14·0	2·5	2·5	19·0	....	9·0	£16/2/0 (PW)
Do. do.	116	A in diamond	Albany Superphosphate Co. Pty. Ltd.	....	....	....	....	14·0	2·5	2·5	19·0	....	9·0	£16/5/6 (AW)
Do. do.	140	Sickle	Cuming Smith & Mt. Lyell Farmers Fertilisers Ltd.	....	....	....	....	14·0	2·5	2·5	19·0		9·0	£16/2/0 (PW)
Do. do.	154	ML in diamond	do. do. do.	....	....	....	....	14·0	2·5	2·5	19·0	....	9·0	£16/2/0 (PW)
Do. do.	173	CSML	do. do. do.	....	....	....	....	14·0	2·5	2·5	19·0	....	9·0	£16/5/6 (PJW)
Super and Potash (1 : 1)	285	CSML in diamond	do. do. do	....	....	....	....	8·5	1·5	1·5	11·5	....	27·0	£25/12/0 (PJW)

Name of Fertiliser	Reg. No.	Registered Brand	By Whom Registered	Nitrogen (N) as				Phosphoric Anhydride (P_2O_5) as				Potash (K_2O) as		Minor Elements									Cash price per ton at Works (W) or on rails at Perth (P)*
				Nitrate	Ammonia	Blo'd and Bone	Urea	W'ter Sol.	Citrate Sol.	Acid Sol.	Total	Sulphate	Muriatel	(Cu)	(Zn)	(Co)	(Mn)	(Mg)	(Fe)	(Mo)	(B)	(Al)	
A. MINERAL—*con.*				%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
7. Phosphoric Anhydride and Minor Elements																							
Super and Copper Ore	55	Cresco	Cresco Fertilisers (W.A.) Ltd.	....	..	....	..	8·0	5·0	5·0	18·0	..	....	1·25	....	....	....	..	....	....	....	....	£16/3/0 (PW)
Super and Manganese	56	do.	do.	do.	....	....	....	....	14·5	2·5	2·5	19·5	....	....	....	....	....	3·8	....	....	....	....	£23/6/0 (PW)
Super and Zinc Oxide	57	do.	do.	do.	....	....	..	..	16·5	2·75	3·25	22·5	....	..	....	1·15	..	....	....	....	..	..	£13/14/0 (PW)
Super and Molybdenum	58	do.	do.	do. ..	..	....	..	..	17·0	3·0	3·0	23·0	....	....	....	....	....	....	....	Trace	....	....	£14/1/0 (PW)
Super and Cobalt	59	do.	do.	do.	.	..	..	.	17·0	3·0	3·0	23·0	....	....	....	....	Trace	....	..	....	....	....	£14/1/6 (PW)
Super and Copper Sulphate	60	do.	do.	do.	....	....	....	..	16·0	2·75	2·75	21·5	....	....	1·25	....	....	....	....	....	....	....	£19/6/6 (PW)
Super, Copper and Zinc	62	do.	do.	do.	....	....	....	....	8·0	5·0	5·0	18·0	....	....	1·25	1·15	....	....	....	....	....	....	£17/5/6 (PW)
Super, Copper, Zinc and Cobalt	63	do.	do.	do.	....	....	....	....	8·0	5·0	5·0	18·0	....	....	1·25	1·15	Trace	....	....	....	....	....	£18/15/0 (PW)
Super, Copper, Zinc and Molybdenum	64	do.	do.	do.	....	....	....	..	8·0	5·0	5·0	18·0	..	....	1·25	1·15	....	....	....	....	Trace	....	£18/14/6 (PW)
Super, Copper, Zinc and Manganese	65	do.	do.	do.	....	..	....	.	7·0	5·0	4·5	16·5	....	....	1·10	1·10	....	2·25	..	....	....	....	£23/7/0 (PW)
Super and Copper ..	108	A in diamond	Albany Superphosphate Co. Pty. Ltd.	....	....	....	.	8·0	5·0	5·0	18·0	....	..	1·25	....	....	..	..	..	.	..	....	£16/3/0 (AW)
Super, Copper, Zinc	109	do.	do.	do.	..	....	....	....	8·0	5·0	5·0	18·0	....	....	1·25	1·15	....	....	....	....	..	....	£17/5/6 (AW)
Super, Copper, Zinc and Molybdenum	110	do.	do.	do.	....	....	..	..	8·0	5·0	5·0	18·0	.	....	1·25	1·15	....	....	....	....	Trace	....	£18/14/6 (AW)
Super, Copper, Zinc and Cobalt	111	do.	do.	do.	....	....	....	....	8·0	5·0	5·0	18·0	....	....	1·25	1·15	Trace	....	....	....	....	....	£18/15/0 (AW)
Super and Zinc ..	112	do.	do.	do.		..	.	..	16·5	2·75	3·25	22·5		..	....	1·15	....	....	....			....	£13/14/0 (AW)
Super and Cobalt ..	113	do.	do.	do.	....	....	.	.	17·0	3·0	3·0	23·0	..	....	..	....	Trace	....	..	.	.	....	£14/1/6 (AW)
Super and Manganese	114	do.	do.	do.	....	....		...	14·5	2·5	2·5	19·5	..	.	....	....	....	3·8	....	....	....	..	£23/6/0 (AW)
Super and Molybdenum	115	do.	do.	do.	....	....	.	..	17·0	3·0	3·0	23·0	..	.	....	....	....	..	....	....	Trace	..	£14/1/0 (AW)
Super and Copper	132	Sickle in diamond	Cuming Smith & Mt. Lyell Farmers Fertilisers Ltd.	....	....	....	....	8·0	5·0	5·0	18·0	....	....	1·25	....	....	....	....	....	....	....	....	£16/3/0 (PW)
Super, Copper, Zinc	133	do. ..	do.	do.	....	..	..	..	8·0	5·0	5·0	18·0	....	.	1·25	1·15	..	....	....	....	....	....	£17/5/6 (PW)
Super, Copper, Zinc, Molybdenum	134	do. . .	do.	do.	....	..	..	....	8·0	5·0	5·0	18·0	....	..	1·25	1·15	....	....	....	....	Trace	....	£18/14/6 (PW)
Super, Copper, Zinc, and Cobalt	135	do.	do.	do.	....	....	....	....	8·0	5·0	5·0	18·0	....	....	1·25	1·15	Trace	....	....	....	....	....	£18/15/0 (PW)
Super and Cobalt ..	136	do.	do.	do.	.	....	....	....	17·0	3·0	3·0	23·0	..	..	..	....	Trace	....	....	....	....	....	£14/1/6 (PW)
Super and Zinc ..	137	do. ..	do.	do.	..	....	....	....	16·5	2·75	3·25	22·5	.	..	..	1·15	....	....	....	....	....	..	£13/14/0 (PW)
Super and Manganese	138	do. ..	do.	do.	....	....	....	....	14·5	2·5	2·5	19·5	..	..	..	....	....	3·8	....	....	....	..	£23/6/0 (PW)
Super and Molybdenum	139	do.	do.	do.	....	....	....	....	17·0	3·0	3·0	23·0	..	..	....	....	....	....	....	Trace	....	....	£14/1/0 (PW)
Super and Copper	151	ML in diamond	do.	do.	....	....	....	....	8·0	5·0	5·0	18·0	....	....	1·25	....	....	....	....	....	....	....	£16/3/0 (PW)
Super, Copper, Zinc	152	do.	do.	do.	.	....	....	.	8·0	5·0	5·0	18·0	..	....	1·25	1·15	....	....	.	....	..	....	£17/5/6 (PW)
Super and Zinc	153	do.	do.	do.	....	....	.	....	16·5	2·75	3·25	22·5	..	....	....	1·15	....	....	....	....	....	....	£13/14/0 (PW)
Super and Copper	165	CSML in diamond	do.	do.	....	....	..	....	8·0	5·0	5·0	18·0	..	..	1·25	....	....	..	....	....	....	....	£16/3/0 (PJW) (GW)
Super, Copper, Zinc	166	do.	do.	do.	....	....	....	....	8·0	5·0	5·0	18·0	....	....	1·25	1·15	....	....	....	....	....	....	£17/5/6 (PJW) (GW)
Super, Copper, Zinc, Molybdenum	167	do.	do.	do.	....	....	....	....	8·0	5·0	5·0	18·0	....	....	....	1·25	1·15	....	....	....	Trace	....	£18/14/6 (PJW)

(BW) Bunbury Works. (PW) Perth Works. (AW) Albany Works. (GW) Geraldton Works. (PJW) Picton Junction Works.

Name of Fertiliser	No. Reg.	Registered Brand	By Whom Registered	Nitrogen (N) as				Phosphoric Anhydride P_2O_5 as				Potash (K_2O) as		Minor Elements								Cash price per ton at Works (W) or on rails at Perth (P)*
				Nitrate	Ammonia	Blo'd and Bone	Urea	W'ter Sol.	Citrate Sol.	Acid Sol.	Total	Sulphate	Muriate	(Cu)	(Zn)	(Co)	(Mn)	(Mg)	(Fe)	(Mo)	(B)	(AL)	
A. MINERAL—*con.*				%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
7. Phosphoric Anhydride and Minor Elements—*con.*																							
Super, Copper, Zinc, Cobalt	168	CMSL in Diamond	Cuming Smith & Mt. Lyell Farmers Fertilisers Ltd.	....	....	....	....	8·0	5·0	5·0	18·0	....	....	1·25	1·15	Trace	....	....	....	....	....	....	£18/15/0 (PJW)
Super and Cobalt	169	do.	do. do.	....	....	....	....	17·0	3·0	3·0	23·0	....	....	....	....	Trace	....	....	....	....	....	....	£14/1/6 (PJW)
Super and Zinc	170	do.	do. do.	....	....	....	....	16·5	2·75	3·25	22·5	....	....	....	1·15	....	....	....	....	....	....	....	£13/14/0 (PJW) (GW)
Super and Manganese	171	do.	do. do.	....	....	....	....	14·5	2·5	2·5	19·5	....	....	....	....	....	3·8	....	....	....	....	....	£23/6/0 (PJW)
Super and Molybdenum	172	do.	do. do.	....	....	....	....	17·0	3·0	3·0	23·0	....	....	....	....	....	....	....	....	Trace	....	....	£14/1/0 (PJW) (GW)
8. Nitrogen, Phosphoric Anhydride and Minor Elements																							
Hydrangea Blueing Toxic	86	Blue Cross	Agricultural Products Co.	....	2·0	....	....	....	....	....	2·0	....	....	....	2·0	....	....	....	3·5	(S) 8·9	....	3·2	Packets
9. Nitrogen, Phosphoric Anhydride, Potash and Minor Elements																							
Clarkson's Fertiliser	4	Clarksons	Clarksons (W.A.) Pty. Ltd.	....	—5·0—		....	3·5	3·5	2·0	9·0	....	5·0	0·5	0·5	....	0·5	0·5	....	0·5	0·5	(Ca) 3·25	Packets
Rose Fertiliser	5	do.	do. do.	....	—5·0—		....	3·5	3·5	2·0	9·0	....	5·0	0·5	0·5	....	0·5	0·5	....	0·5	0·5	(Ca) 3·25	Packets
Special Lawn Manure	18	Wesfarmers	Westralian Farmers Co-op. Ltd.	....	—5·9—		....	5·1	2·0	4·0	11·1	....	2·3	Trace	Trace	....	Trace	Trace	Trace	Trace	Trace	Trace	Packets
Citrus Manure	19	do.	do. do.	....	—5·2—		....	5·1	2·0	4·0	11·1	....	4·6	Trace	Trace	....	Trace	Trace	Trace	Trace	Trace	Trace	Packets
Rose Manure	20	do.	do. do.	....	—3·8—		....	6·3	1·8	3·7	11·8	....	7·1	Trace	Trace	....	Trace	Trace	Trace	Trace	Trace	Trace	Packets
Nitrifert	21	do.	do. do.	....	—5·2—		....	5·1	2·0	4·0	11·1	....	4·6	Trace	Trace	....	Trace	Trace	Trace	Trace	Trace	Trace	Packets
Complete Red	24	do.	do. do.	0·6 as Ammonium Nitrate 5·4 as Potassium Nitrate 1·6 as Mono/Di-ammonium Phosphate 5·4 as Ammonium Chloride				5·4 as Mono/Di-ammonium Phosphate 7·6 as Dicalcium Phosphate				19·1 as Potassium Nitrate 1·9 as Potassium Chloride		Trace	Trace	....	Trace	Trace	Trace	Trace	Trace	Trace	£53/18/6 (P) (PW)
Lawn Food ..	37	Berry's	Berry Hardware Pty. Ltd.	....	12·0	....	....	3·25	0·5	0·5	4·25	....	11·5	0·1	0·3	....	....	....	....	....	....	....	£65
Nitrophoska Blue	38	B.A.S.F.	Henry H. York & Co. Pty. Ltd.	7·9 as Ammonium Sulphate 2·6 as Potassium Nitrate 1·5 as Mono/Di-ammonium Phosphate				5·0 as Mono/Di-ammonium Phosphate 7·0 as Dicalcium Phosphate				8·9 as Potassium Nitrate 10·1 as Potassium Sulphate		·002 to ·003	·011 to 0·13	....	·002 to ·003	1·07	....	Trace	·001 to ·005	....	£53/18/6 (P)
Nitrophoska Green	39	do.	do. do.	4·2 as Ammonium Nitrate 4·5 as Potassium Nitrate				6·6 as Mono/Di-ammonium Phosphate 8·4 as Dicalcium Phosphate				15·0 as Potassium Nitrate		·002 to ·003	·011 to ·013	....	·002 to ·003	0·31	....	·0001	·001 to ·005	....	£59/10/0 (P)

Nitrophoska Red	40	do.	do.	do.	1·9 as Mono/Di-ammonium Phosphate 4·5 as Ammonium Chloride 0·6 as Ammonium Nitrate 5·4 as Potassium Nitrate 1·6 as Mono/Di-ammonium Phosphate 5·4 as Ammonium Chloride	....	12·0	....	....	5·4 as Mono/Di-ammonium Phosphate 7·6 as Dicalcium Phosphate				18·1 as Potassium Nitrate 1·9 as Potassium Chloride		·002 to ·003	·011 to ·013	....	·002 to ·003	0·21	....	·0001	·001 to ·005	....	£53/18/6 (P)
Special Mixture "363"	71	Cresco	Cresco Fertilisers (W.A.) Ltd.		....	12·0	....	....	3·25	0·5	0·5	4·25	....	11·5	0·1	0·3	....	....	....	....	....	....	....	£30/10/0 (PW)
Boost Crop	85	Blue Cross	Agricultural Products Co.		....	4·0	....	....	1·0	2·0	5·0	8·0	<–3·0–>		ppm 90	ppm 90	....	ppm 200	ppm 275	ppm 320	ppm 4	ppm 13	ppm 90	
Fertosol	88	do.	do.	do.	....	Total 26·0		....	13·0	....	....	13·0	17·0	....	ppm 1000	ppm 100	....	ppm 120	ppm	ppm 500	ppm 50	ppm 50	ppm	Packets
Rose Bush Fertiliser	89	do.	do.	do.	....	4·0	....	....	2·0	2·0	4·0	8·0	3·0	....	ppm 45	ppm 45	....	ppm 100	ppm 145	160	2	6	45	Packets
Pot Plant Pellets	90	do.	do.	do.	....	....	....	8·2	8·2	....	....	8·2	9·0	....	Trace	Trace	....	Trace	....	....	....	....	....	Packets
Cardex	94	do.	do.	do.	....	....	5·0	....	....	2·0	....	2·0	....	2·5	0·4	0·6	....	....	0·5	0·5	....	....	0·4	Packets
Citrus Manure	96	do.	do.	do.	....	4·0	....	....	2·0	5·0	2·0	9·0	<–3·0–>		ppm 250	ppm 250	....	....	ppm 750	ppm 1000	ppm 12	ppm 35	ppm 250	Packets
Lawn Manure	97	do.	do.	do.	....	4·0	....	....	1·0	1·0	6·0	8·0	2·0	....	ppm 45	ppm 45	....	ppm 100	ppm 145	ppm 160	ppm 2	ppm 6	ppm 45	Packets
Lawn Fertiliser (with Trace Elements)	147	Sickle in diamond	Cuming Smith & Mt. Lyell Farmers Fertiliser Ltd.		....	11·0	....	....	4·0	0·5	0·5	5·0	....	7·5	1·8	0·7	....	....	....	....	....	....	....	£29/3/6 (PW)
Do. do.	161	ML in diamond	do.	do.	....	11·0	....	....	4·0	0·5	0·5	5·0	....	7·5	1·8	0·7	....	....	....	....	....	....	....	£29/3/6 (P)
Tobacco Fertiliser No. 2	182	CSML in diamond	do.	do.	....	3·0	....	....	7·5	1·5	1·5	10·5	15·0	...	2·7	·09	....	....	....	....	....	....	....	£27/12/6 (PJW)
Rose Manure	196	David Grays	David Gray & Co. Ltd.		....	....	<–5·0–>		3·5	3·5	2·0	9·0	....	5·0	·05	·05	....	·05	·05	·05	·05	·05	(Ca) 3·25	Packets
Lawn Fertiliser	197	do.	do.	do.	....	<–5·0–>		....	3·5	3·5	2·0	9·0	....	5·0	·05	·05	....	·05	·05	·05	·05	·05	(Ca) 3·25	Packets
Special Garden Fertiliser	209	do.	do.	do.	....	<–5·0–>		....	3·5	3·5	2·0	9·0	....	5·0	·05	·05	....	·05	·05	·05	·05	·05	(Ca) 3·25	Packets
Citrus Manure	210	do.	do.	do.	....	<–5·0–>		....	3·5	3·5	2·0	9·0	....	5·0	·05	·05	....	·05	·05	·05	·05	·05	(Ca) 3·25	Packets
Daphne Mix	218	Keoghs	Wilcox Mofflin Ltd.		....	<–6·1–>		....	14·0	....	0·6	14·6	3·2	....	Trace	Trace	....	....	Trace	Trace	....	....	(CaO) 18·5	Packets
Rose Food	219	do.	do.	do.	....	<–5·7–>		....	7·5	....	0·3	7·8	10·7	....	Trace	....	....	Trace	Trace	Trace	Trace	Trace	(CaO) 9·4	Packets
Specially Prepared Lawn Manure	225	Boans	Boans Ltd.		....	12·0	....	....	3·25	0·5	0·5	4·25	11·5	....	0·1	0·3	....	....	....	....	....	....	....	Packets
"365"	232	Dawsons	Dawson Harrison Pty. Ltd.		....	8·2	....	....	3·4	0·6	0·6	4·6	....	3·8	0·12	0·06	....	....	....	....	....	....	....	£39/0/0 (PW)
Lawn Food	233	do.	do.	do.	....	11·5	....	....	4·75	0·75	0·75	6·25	6·5	....	0·4	0·65	....	....	....	....	....	....	....	£33/10/4 (plus Bags)
Vigoro Plant Food	234	do.	do.	do.	....	<–6·04–>		....	2·68	2·26	8·76	13·7	5·85	....	0·4	0·65	....	....	....	....	....	....	(CaO) 17·6	£45/0/0 (PW)
Rose Food	236	do.	do.	do.	....	<–6·04–>		....	2·68	2·26	8·76	13·7	5·85	....	0·4	0·65	....	....	....	....	....	....	(CaO) 17·6	£45/0/0 (PW)
Rapidgro	237	do.	do.	do.	....	8·9	....	....	3·4	0·6	0·6	4·6	....	3·6	0·12	0·06	....	....	....	....	....	....	(CaO) 30·0	£39/0/0 (W)
Bumpercrop	250	Lanes	Lanes (W.A.) Pty. Ltd.		0·5 as Ammonium Nitrate 5·5 as Ammonium Chloride 5·5 as Potassium Nitrate 1·5 as Mono/Di-ammonium Phosphate				5·2 as Mono/Di-ammonium Phosphate 7·8 as Dicalcium Phosphate				18·5 as Potassium Nitrate 2·5 as Potassium Chloride		·002	·01	....	·002	0·4	....	....	·001	....	£53/18/6 (P)

(AW) Albany Works. (BW) Bunbury Works. (GW) Geraldton Works. (PW) Perth Works. (PJW) Picton Junction Works.

Name of Fertiliser	Reg. No.	Registered Brand	By Whom Registered	Nitrogen (N) as				Phosphoric Anhydride P_2O_5 as				Potash (K_2O) as		Minor Elements								Cash price per ton at Works (W) or on rails at Perth (P)*
				Nitrate	Ammonia	Blo'd and Bone	Urea	W'ter Sol.	Citrate Sol.	Acid Sol.	Total	Sulphate	Muriate	(Cu)	(Zn)	(Co)	(Mn)	(Mg)	(Fe)	(Mo)	(B)	(AL)	
A. MINERAL—*con.*				%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
9. Nitrogen, Phosphoric Anhydride, Potash and Minor Elements—*contd.*																							
Rose Manure	256	Apex	E. J. Fry Pty. Ltd.	....	....	3·0	....	5·0	2·0	6·0	13·0	....	9·0	·03	·015	....	·02	·05	....	·005	·003	....	£40/10/0 (P) (PW)
Rose Food	260	Evergreen Fertilisers	Voldemars Ertners	....	<—9·5—>		....	1·95	1·1	3·5	6·55	....	6·6	·06	·18	....	....	....	....	....	....	....	Packets
Special Lawn Manure	261	do.	do. do.	....	12·0	....	....	3·25	0·5	0·5	4·25	11·5	....	0·1	0·3	....	....	..	....	....	..	....	Packets
Greengro	266	Green Garden	Green Garden Products	....	<——7·0——>			8·6	1·4	1·4	11·4	<—6·9—>		0·3	0·3	....	0·5	....	....	....	....	..	£49/0/0 (P)
Greengro "R"	267	do.	do. do.	....	<——7·0——>			8·6	1·4	1·4	11·4	<—6·9—>		0·3	0·3	....	0·5	....	12·0	....	....	....	£56/0/0 (P)
Greengro "C"	268	do.	do. do.	....	<——7·0——>			8·6	1·4	1·4	11·4	<—6·9—>		0·6	0·6	....	0·5	10·0	....	....	....	....	£50/0/0 (P)
Greenquik	270	do.	do. do.	....	<——10·0——>			8·6	1·4	1·4	11·4	....	7·0	0·3	0·3	....	0·5	....	....	....	....	....	£70/0/0 (P)
Complete Plant Food	271	Fosterite	H. S. Emmerson	....	<——4·0——>			1·0	2·0	5·0	8·0	<—3·0—>		ppm 90	ppm 90	....	ppm 200	ppm 275	ppm 320	....	ppm 13	ppm 90	Packets
The Complete Lawn Food	273	Quik-gro	Creamota Ltd.	....	<—9·46—>		....	1·1	0·91	1·12	3·13	1·0	2·0	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	....	Packets
The Complete Pelletised Plant Food for Flowers	274	do.	do.	..	<—7·06—>		.	6·1	2·2	2·5	10·8	0·67	2·32	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	..	Packets
The Complete Pelletised Plant Food for Pot and Indoor Plants	275	do.	do. ..	..	<—4·16—>		...	2·4	1·5	0·3	4·2		2·0	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	....	Packets
The Complete Pelletised Plant Food for Roses	276	do.	do.	..	<—9·46—>		....	1·1	0·91	1·12	3·13	1·0	2·0	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	....	Packets
The Complete Pelletised Plant Food for Shrubs and Fruit Trees	277	do.	do.	....	<—7·06—>		....	5·8	2·1	2·1	10·0	0·67	2·32	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	....	Packets
The Complete Pelletised Plant Food for Vegetables	278	do.	do.	....	<—7·06—>		....	6·4	2·8	2·7	11·9	0·67	2·32	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	....	Packets
Rustica Complete (13 : 13 : 21)	286	Swift	Swift & Co. Ltd.	0·5 as Ammonium Nitrate 5·5 as Ammonium Chloride 5·5 as Potassium Nitrate 1·5 as Mono/Di-ammonium Phosphate				5·2 as Mono/Di-ammonium Phosphate 7·8 as Dicalcium Phosphate				18·5 as Potassium Nitrate 2·5 as Potassium Chloride		·002	·01	....	·002	0·4	....	....	·001	....	£53/18/6 (P)
Rustica Complete (15 : 15 : 15)	290	do.	do. do.	4·3 as Ammonium Nitrate 4·5 as Ammonium Chloride 4·5 as Potassium Nitrate 1·7 as Mono/Di-ammonium Phosphate				6·0 as Mono/Di-ammonium Phosphate 9·0 as Dicalcium Phosphate				15·0 as Potassium Nitrate		·002	·01	....	·002	0·4	....	....	·001	....	£60/18/6

10. Nitrogen and Minor Elements																									
C.A.N. (Calcium Ammonium Nitrate)	23	Wesfarmers	Westralian Farmers Co-op. Ltd.	10·25	10·25	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	($CaCo_3$) 37·5	....	£36/0/0 (P)
Nitro Green	41	B.A.S.F.	Henry H. York & Co. Ltd.	10·46	10·27	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	(CaO) 36·5	....	£36/0/0 (P)
Fe-Ro-Chelate	93	Blue Cross	Agricultural Products Co.	....	....	....	15·0	....	....	....	....	....	....	....	....	....	....	....	3·0	....	....	....	....	Packets
Green Free	269	Green Garden	Green Garden Products	....	7·0	....	....	....	....	....	....	....	....	....	....	(Ferrous Sulphate) 66·0							....	£63/0/0 (P)
11. Trace Elements																									
Minorels	76	Blue Cross	Agricultural Products Co.	....	....	....	....	....	....	....	....	....	....	1·0	0·7	(CaO) 5·02	2·25	3·3	3·5	0·04	0·1	1·0	Packets
Aluminium Sulphate (Bluing Powder)	77	do.	do. do.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	20·0	Packets
Boran (Borax)	78	do.	do. do.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	10·0	....	Packets
Magnesium Sulphate	79	do.	do. do.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	20·0	....	....	....	....	Packets
Iron Sulphate	81	do.	do. do.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	20·0	....	....	....	Packets
Zinc Sulphate	82	do.	do. do.	....	....	....	....	....	....	....	....	....	....	....	22·0	....	....	....	....	....	....	....	Packets
Manganese Sulphate	83	do.	do. do.	....	....	....	....	....	....	....	....	....	....	....	....	....	22·0	....	....	....	....	....	Packets
Bluestone	84	do.	do. do.	....	....	....	....	....	....	....	....	....	....	25·0	....	....	....	....	....	....	....	....	Packets
Copper Ore	123	A in diamond	Albany Superphosphate Co. Pty. Ltd.	....	....	....	....	....	....	....	....	....	....	7·5	....	....	....	....	....	....	....	....	£34/10/0 (AW)
Copper Sulphate	124	do.	do. do.	....	....	....	....	....	....	....	....	....	....	25·0	....	....	....	....	....	....	....	....	£155/0/0 (AW)
Zinc Oxide	125	do.	do. do.	....	....	....	....	....	....	....	....	....	....	....	75·0	....	....	....	....	....	....	....	£84/0/0 (AW)
Manganese Sulphate	126	do.	do. do.	....	....	....	....	....	....	....	....	....	....	....	....	....	25·0	....	....	....	....	....	£82/0/0 (AW)
Cobalt Sulphate	127	do.	do. do.	....	....	....	....	....	....	....	....	....	....	....	....	20·0	....	....	....	....	....	....	6s. 3d. per lb. (AW)
Molybdenum Oxide	128	do.	do. do.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	56·0	....	....	20/– per lb. (AW)
Copper Ore	187	CSML in diamond	Cuming Smith & Mt. Lyell Farmers Fertiliser Ltd.	....	....	....	....	....	....	....	....	....	....	7·5	....	....	....	....	....	....	....	....	£34/10/0(PW) (GW) (BW)
Copper Sulphate	188	do.	do. do.	....	....	....	....	....	....	....	....	....	....	25·0	....	....	....	....	....	....	....	....	£150/0/0(PW) (BW)
Zinc Oxide	189	do.	do. do.	....	....	....	....	....	....	....	....	....	....	....	75·0	....	....	....	....	....	....	....	£84/0/0 (PW) (GW) (BW)
Manganese Sulphate	190	do.	do. do.	....	....	....	....	....	....	....	....	....	....	....	....	....	25·0	....	....	....	....	....	£82 (PW) (BW)
Cobalt Sulphate	191	do.	do. do.	..	.	....	....	..	....	....	....	....	..	..	.	20·0	....	....	.	....	..	..	6/3d. per lb. (PW) (BW)
Molybdenum Oxide	192	do.	do. do.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	56·0	....	....	20/– per lb. (PW) (BW)
Cupper Sulphate ..	207	David Grays	David Gray & Co. Ltd.	....	....	.	..	....	....	....	....	....	....	39·5	.	....	..	.	....	....	....	....	Packets
Zinc Oxide	241	Greengro	Barrow Linton Pty. Ltd.	....	....	....	....	....	....	....	....	....	....	....	55·0	....	....	....	....	....	....	....	£77/0/0 (PW) in cwt. bags
Copper Ore	242	do.	do. do.	....	....	....	....	....	....	....	....	....	....	8·0	....	....	....	....	....	....	....	....	£35/10/0 (P) in cwt. bags
Comozin	243	do.	do. do.	..	..	....	.	..	..	..	..	..	..	4·6	6·4	.	.	.	....	0·23	....	....	£54/10/0 (P) in cwt. bags
Copper-Zinc Premix	244	do.	do. do.	....	....	....	....	....	....	....	..	..	..	6·6	9·2	.	..	..	.	....	....		£45/0/0 (P) in cwt. bags
Ess-Min-El	248	Lanes	Lanes (W.A.) Pty. Ltd.	....	....	....	....	....	....	....	....	....	....	1·4	0·23	....	2·7	5·5	5·0	0·2	0·11	....	£118/10/0 (P)
Trace Elements	272	Fosterite	H. S. Emmerson	....	....	....	....	....	....	....	....	....	....	1·0	0·7	(CaO) 5·0	2·25	3·3	3·5	0·04	0·1	1·0	Packets
12. Liquid Fertilisers																									
Indoor Plant Food	32	Wesfarmers	Westralian Farmers Co-op. Ltd.	....	5·0	..	..	2·5	..	....	2·5	(Nitrate) 2·0	Trace	....	....	Trace	Trace	Trace	Trace	....	..	Bottles
Liquid Manure	33	do.	do. do.	....	10·0	....	....	5·0	....	....	5·0	(Nitrate) 4·5	Trace	....	....	Trace	Trace	Trace	Trace	....	....	Bottles

(AW) Albany Works. (BW) Bunbury Works. (GW) Geraldton Works. (PW) Perth Works. (PJW) Picton Junction Works.

Name of Fertiliser	Reg. No.	Registered Brand	By Whom Registered	Nitrogen (N) as				Phosphoric Anhydride P_2O_5 as				Potash (K_2O) as		Minor Elements								Cash price per ton at Works (W) or on rails at Perth (P)*
				Nitrate	Ammonia	Blo'd and Bone	Urea	W'ter Sol.	Citrate Sol.	Acid Sol.	Total	Sulphate	Muriate	(Cu)	(Zn)	(Co)	(Mn)	(Mg)	(Fe)	(Mo)	(B)	(AL)	
A. MINERAL—*cont.*				%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
12. Liquid Fertilisers *—continued*																							
Liquid Manure	35	Watkins	Watkins Products Inc.	....	22·0	....	....	12·0	....	....	12·0	(Nitrate) 14·0		Trace	Trace	....	Trace	....	Trace	Trace	Trace	...	Bottles
Flor-A-Stimulant	36	Elixier	Vapor Industries	..	·775	....	....	·946	....	0·18	1·126	(Nitrate) 1·88		Trace	Trace	....	Trace	Trace	Trace	Trace	Trace	Trace	Bottles
Liquid Fertiliser	92	Blue Cross	Agricultural Products Co.	....	....	....	6·5	5·0	....	....	5·0	(Nitrate) 3·0		....	....	....	....	....	....	....	....	....	Bottles
Do. do.	199	David Grays	David Gray & Co. Ltd.	<–9·0–>		....	....	13·1	....	....	13·1	(Nitrate) 4·0		Trace	Trace	....	Trace	....	....	....	....	....	Bottles
Concentrated Fertiliser	215	Spring	F. H. Faulding & Co. Ltd.	....	....	....	7·5	5·0	....	....	5·0	4·0		....	....	....	....	....	....	....	....	....	Bottles
Liquid Manure	220	Keogh's	Wilcox Mofflin Ltd.	..	1·7	....	....	3·7	0·1	....	3·8	2·0	..	Trace	Trace	....	Trace	....	..	Trace	....	....	Bottles
Liquid Fertiliser and Plant Food	246	Lane's	Lanes (W.A.) Pty. Ltd.	....	....	....	8·6	8·6	....	....	8·6	4·0	....	0·15	0·12	....	0·15	0·2	0·4	0·077	0·5	....	Bottles
Flora-Gro Water Soluble Liquid Manure	249	do.	do. do.	....	....	....	24·0	12·0	....	....	12·0	....	16·0	....	....	....	....	....	....	....	....	....	Packets

Name of Fertiliser	Reg. No.	Registered Brand	By Whom Registered	Nitrogen (N) as				Phosphoric Anhydride (P_2O_5) as				Fine Material		Cash Price per ton at Works (W) or on Rails at Perth (P) *
				Nitrate	Ammonia	Blood and Bone	Urea	Water Soluble	Citrate Soluble	Acid Soluble	Total	(A)	(B)	
B. ORGANIC FERTILISERS				%	%	%	%	%	%	%	%			
1. Blood and Bone														
Blood and Bone	1	Mars	Fergusons (By Products) Pty. Ltd.	....	....	6·0	....	....	3·5	11·5	15·0	100	55	£34 (W)
Do.	15	Symonds	E. Symonds & Co.	....	....	5·25	....	....	2·5	6·5	9·0	100	65	Packets
Do.	25	Wesfarmers	Westralian Farmers Co-op. Ltd.	....	....	5·0	....	....	2·0	7·15	9·15	100	55	£36/0/0 (P)
Do.	34	Wyndham	Wyndham, Freezing, Canning and Meat Export Works	....	....	6·0	....	....	5·5	9·5	0·91	100	55	£36·10/6 (P) £25/5/0 (Wyndham Works)
Blood and Bone No. 1	48	Sound	Cockburn Sound Fertilisers Pty. Ltd.	....	....	6·0	....	....	4·0	8·0	12·0	100	55	£35/0/0
Blood and Bone	49	do.	do. do. do.	....	....	5·25	....	....	2·5	6·5	9·0	100	65	£32/0/0
Blood and Bone Fertiliser	104	Blue Cross	Agricultural Products Co.	....	....	5·0	....	....	2·0	7·0	9·0	100	55	Packets
Blood and Bone	200	David Grays	David Gray & Co. Ltd.	....	....	5·0	..	....	2·0	8·0	10·0	100	55	Packets
Do.	211	Waruna	L. H. Rawling & Co.	....	....	7·0	....	0·16	3·0	9·0	12·16	100	55	£47/0/0 (P) (W)
Do.	217	Eclipse	The West Australian Meat Export Works	....	....	6·0	....	....	3·0	9·0	12·0	100	55	£31/0/0 (W)
Do.	222	T.B. & S. in diamond	Thos. Borthwick & Sons (A'Asia) Ltd.	....	....	5·75	....	....	6·75	5·25	12·0	100	55	£35/10/0 (AW) £38/0/0 (P)
Do.	226	Boans Ltd.	Boans Ltd.	....	....	6·0	....	....	4·0	11·0	15·0	100	55	Packets
Do.	238	Excelsior	J. Kitchen & Sons Pty. Ltd.	....	....	7·2	....	....	6·0	7·0	13·00	100	55	£30/0/0 F.O.B. Melbourne
Do.	239	Kitchens	do. do. do.	....	....	6·8	....	....	9·0	5·0	14·0	100	55	£30/0/0 F.O.B. Melbourne
Do.	255	Apex	E. J. Fry Pty. Ltd.	....	....	6·0	..	..	4·0	11·0	15·0	100	55	£39/17/6 (W)
Do.	265	Evergreen Fertilisers	Voldemars Ertners	....	....	5·0	..	..	2·0	7·15	9·15	100	55	Packets
Blood and Bone Pellets	279	Quik-Gro	Creamota Ltd.	....	....	5·0	....	....	6·0	8·0	14·0	....	....	Packets

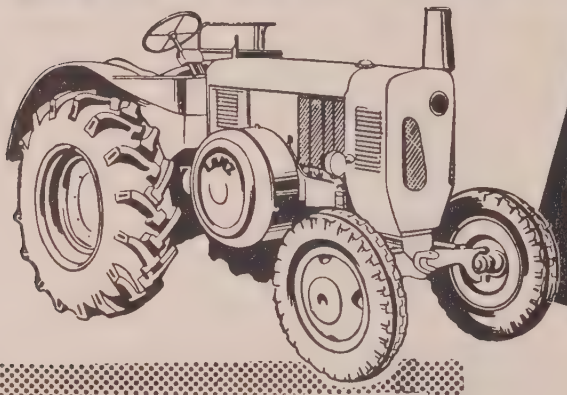
2. Animal Fertilisers														
Bone Dust	2	Fertillo	Davis Gelatine (Aust.) Pty. Ltd.	....	....	1·0	....	....	8·0	22·0	30·0	100	55	£30/0/0 (P)
Animal Organic and Mineral Fertiliser	16	Wooltana	Wooltana Industries Pty. Ltd.	....	....	4·0	....	....	2·0	7·15	9·15	....	....	£29/0/0 (P)
Garden Fertiliser	50	Sound	Cockburn Sound Fertilisers	....	....	4·0	....	3·0	1·0	2·0	6·0	100	55	£25/0/0 (P)
Bone Fertiliser	73	Blue Cross	Agricultural Products Co.	....	....	3·0	....	....	2·0	7·0	9·0	....	....	Packets
Animal Fertiliser	103	do.	do. do. do.	....	....	3·5	....	....	3·0	9·0	12·0	....	....	Packets
Garden Fertiliser	216	Eclipse	The West Australian Meat Export Works	....	....	4·0	....	1·0	2·0	3·0	6·0	100	55	£25/0/0 (W)
Meat Meal Fertiliser	235	Dawsons	Dawson Harrison Pty. Ltd.	....	....	4·59	.	0·14	6·56	9·6	16·3	100	73	£32/10/0 (W)
Pulverised Poultry Manure Potash Fortified	251	Gays	B. J. Gay & Sons	....	....	1·5	....	.	....	....	2·0	Potash	2·0%	£60/0/0 (P) in 2½ lb. bags
3. Fish Fertiliser														
Fish Fertiliser	51	Sound	Cockburn Sound Fertilisers Pty. Ltd.	....	....	4·0	....	....	2·0	6·0	8·0	100	65	£28/0/0 (W)
Special Fish Manure	102	Blue Cross	Agricultural Products Co.	....	....	3·5	....	....	....	....	7·5	....	....	Packets
Crayfish Meal	240	Sea-Breeze	Fremantle Fishermen's Co-op.	....	....	6·25	....	...	....	....	4·93	(CaO) 10·51	....	£26/0/0 (W)
Crayfish Meal Fertiliser	252	Golden Gleam	Golden Gleam Fish Processing Co. Pty. Ltd.	....	....	6·25	....	....	0·85	0·75	1·6	100	55	£32/0/0 (GW)

Name of Fertiliser	Reg. No.	Registered Brand	By Whom Registered	Neutralising Value	Cash Price per ton at Works (W) or on Rails, Perth (P)
				%	
C. AGRICULTURAL LIME					
Hydrated Lime	3	Swan	Swan Portland Cement Ltd.	93	£11/10/0 (W), £12/0/0 (P)
Agricultural Lime	31	Wesfarmers	Westralian Farmers Co-op. Ltd.	95	Packets
Garden Lime	91	Blue Cross	Agricultural Products Co.	75	Packets
Do.	208	David Gray's	David Gray & Co. Ltd.	75	Packets
Do.	224	Boans	Boans Ltd.	75	Packets
Hydrated Lime	280	Hydro	Perth Modelling Works Pty. Ltd.	120	£13/10/0 (P)

(PW) Perth Works. GW) Geraldton Works. (AW) Albany Works. (PJW) Picton Junction Works.

* Prices in above list are at as 1st November. 1960 and subject to variation during the year. For current prices at any period buyers should consult manufacturers and dealers price lists.

LANZ "DT"



POWERFUL ROBUST RELIABLE

- DRAWBAR H.P. 54
- DRAWBAR PULL 8,100 LBS.
- GEARS — 9 FORWARD, 3 REVERSE.
- HYDRAULIC LIFT WITH 3-POINT LINKAGE.
- NEW BALANCED CRANKSHAFT ELIMINATES VIBRATION.

Here's a reliable, robust tractor with plenty of power to tackle the heaviest farming jobs. The "DT" has a speed to suit every job — 9 forward gears, including 3 creeper, and 3 reverse. The exclusive LANZ single cylinder, two-stroke diesel engine gives amazing power with great economy in fuel costs and maintenance. Its swinging drawbar is another feature that gives you greater versatility.

Call your Wigmore's representative for complete details !

LANZ

WIGMORES TRACTORS PTY. LTD.
A DIVISION OF WIGMORES LIMITED

DISTRIBUTORS OF TRACTORS & EARTHMOVING EQUIPMENT

GREAT EASTERN HIGHWAY ——— GUILDFORD
PHONE 79 1651

WIGMORES TRACTORS PTY. LTD.
Gt. Eastern Highway, Guildford, W.A.
Please send details on the LANZ model DT.

NAME .....

ADDRESS .....

.....

VIRUS PNEUMONIA OF PIGS

By J. CRAIG, M.R.C.V.S., Senior Veterinary Surgeon and
N. MACINTYRE, M.D.A. (Hons.), Pig Husbandry Instructor, Muresk

THIS disease is widespread in Western Australia and is undoubtedly a most serious source of economic loss to the pig industry. The effects of virus pneumonia are such that in badly managed herds, widespread pneumonic outbreaks and deaths are common. By contrast, in well managed herds, there is the more insidious problem of low or nil death rates, accompanied however by an appreciable fall in animal production.

It has been clearly shown in many scientific observations, that pigs affected with infectious pneumonia have—

(a) their growth depressed by 16 per cent.,
(b) their weaning weights depressed by 23 per cent.,
(c) their feed utilisation and conversion abilities depressed by 22 per cent.

Young Berkshire slips of the same age but from different litters. One is pneumonia free whilst the other is affected with virus pneumonia and shows a markedly reduced growth rate

In effect, whereas it takes pneumonia affected pigs 6-6½ months to reach dressed bacon weights of 135-140 lb., pneumonia free pigs can reach this weight in 5-5½ months.

It is quite clear that even in its less obvious forms, virus pneumonia not only reduces the margin of profit in each pig but limits the number of profitable pigs the farmer can turn over yearly.

CAUSE

The disease is caused by a virus which has an affinity for lung tissue. Until fairly recently it was believed, quite wrongly, that a mixed bacterial infection was responsible for the symptoms seen, but it is now known that these bacteria are merely secondary invaders. They cannot produce the disease in the absence of the virus, although they do appear to increase its severity.

The infection is spread from pig to pig following the act of coughing, when fine droplets of moisture in which the virus is present, are disseminated through the air.

Although pigs which have recovered from the active phase of the disease may appear quite healthy, the virus persists in their lungs and they remain a potent source of further infection where other pigs are concerned. In this symptomless carrier status, breeding sows with pneumonic lesions readily transmit the infection to their litters, whilst similarly affected store pigs may introduce and perpetuate the disease in any piggeries into which they happen to be introduced.

The general incidence of the infection can be best judged at post-mortem, and observations at abattoirs indicate that at least one third of the pigs that are slaughtered show lung damage typical of virus pneumonia.

SYMPTOMS

The symptoms seen, broadly fall into two patterns—acute and chronic.

The acute disease is most often seen in young pigs—weaners and slips—which show symptoms of listlessness, refusal to eat, high temperature, laboured breathing and coughing. The death rate in some instances is quite high, whilst animals which do survive are slow to recover and frequently remain unthrifty and stunted.

The chronic disease is the form most commonly encountered, the predominant symptom being spasmodic coughing; this can usually be induced with little difficulty after forced exercise. Such pigs are frequently bad doers and fail to thrive; others appear fairly normal, but their growth rate is so retarded that a much longer period and a greater feed intake is necessary for the pigs to reach marketable weights.

Post mortem lesions of virus pneumonia

POST MORTEM

At post mortem, the affected lungs are seen to contain consolidated areas of pneumonia; these are firm and solid to touch, their colour varying from dark red to grey. The pneumonic parts are clearly demarcated from normal healthy lung tissue which is spongy, soft to touch and pink.

In some cases pleurisy is present, the lungs being firmly adhered to the chest wall.

PREDISPOSING FACTORS

The influence of environmental stress factors favour the spread of virus pneumonia. Exposure to inclement conditions and failure to provide adequate nutrition are important predisposing causes, and the incidence of infectious pneumonia is especially high in herds where there are shortcomings in management, nutrition and hygiene.

Yet another important factor may be the injuries inflicted by the migrating larvae of the common round worm (*Ascaris lumbricoides*). During the migration of these larvae through the lungs, tissue damage may be so great as to lower the resistance of these organs to micro-organisms such as the virus of swine pneumonia.

Due emphasis must therefore be directed towards efficient management, adequate housing, high standard feeding and internal parasitic control.

Whilst sties and shelters need not, under W.A. conditions, be elaborate, they must be warm, well ventilated and free from draughts, and the floors must be above ground to avoid dampness. The ration fed must be adequate both in quality and quantity, and should approximate departmental recommendations where protein, minerals and vitamins are concerned. Vitamin A is particularly important, and in the absence of green feed during the long dry W.A. summer period, a proprietary Vitamin A supplement must be made available.

By increasing the resistance of the pigs these measures will minimise the effects of the infection but they cannot prevent its spread or eliminate losses. These ends can only be achieved by total eradication of the disease.

ERADICATION MEASURES

The control of infectious pneumonia by conventional methods of quarantine and slaughter of the affected pigs was attempted, unsuccessfully, many years ago. Even the use of such modern miracle drugs as the anti-bacterials and anti-biotics, fail to check and eliminate the infection from the herd; nor can any reliance be placed on commercial "pneumonia vaccines," which incidently, are merely cultures of the secondary lung bacteria and not made up of the actual virus which causes the disease.

Fortunately, recent research in Great Britain and Australia has thrown new light on the problem, and indicate steps, which if carefully carried out, can lead to the eventual control and complete elimination of this disease from pig herds.

Once free of the infection, a herd can be relied upon to remain so, provided the disease is not re-introduced.

Two methods are available there.

The first involves the complete sale of all pigs from the property followed by complete restocking, after a brief interval, with stock from a known virus pneumonia free herd. This method is an attractive one, but unfortunately there are no certified pneumonia free herds in W.A. from which to restock at the present moment.

The second involves using the litter to determine whether the sow is a carrier of the infection, and in this respect due advantage is taken of the fact that the pneumonia virus survives only briefly in the ground or in sties, and cannot spread from infected to non-infected pigs provided a distance of at least 10 feet is maintained between the pigs.

The eradication of infectious pneumonia by the latter method is divided into three phases.

Phase 1.

The initial step is to divide the pig herd into isolated small units to halt the further spread of the infection; such a unit is made up of the sow and her litter.

In this litter of cross-bred slips affected with virus pneumonia, two obvious "runts" can be seen

These individual units must be sufficiently isolated to prevent cross infection taking place, and under paddock conditions a quarantine barrier of 10 feet between the litters is necessary. Where pigs are housed in enclosed sties it is usual to leave an empty pen between each unit, but such a quarantine space should preferably be greater than 10 feet. It is quite obvious that secure fencing must be an essential prerequisite to this programme.

Each sow farrows in isolation and remains strictly segregated with her litter until weaning. Any litter which develops symptoms of coughing must be considered for rejection and, together with the sow should be sold for slaughter. Litters which remain apparently healthy and show no evidence of coughing, are kept intact until they reach an economic slaughter weight as porkers, when at least 50 per cent. plus 1 of the litter—barrows or cull gilts—are killed and their lungs given a careful veterinary examination to determine whether or not virus pneumonia is present.

If any pneumonia lesions are seen, the sow and her remaining progeny must be sold for slaughter.

If no evidence of pneumonia is detected, it may be safely assumed that the remaining litter mates can be used for future breeding and will form the nucleus of a virus pneumonia free herd. The sow herself however, must be disposed of for slaughter as soon as practicable, since the production of one "clean" litter is no guarantee of this same process being repeated on a future occasion, e.g., some infected sows only intermittently pass on the virus infection with the result that one litter may be non-infected whilst the next may be infected.

Of particular interest in this respect are recent English observations which show that—

Young sows—55 per cent. produce infected litters.

Mixed age sows—26 per cent. produce infected litters.

Old sows—6 per cent. produce infected litters.

Phase 2.

The young apparently pneumonia free gilts kept for breeding are again tested under the same isolation procedure to make sure they are free; and final confirmation of their freedom from virus pneumonia is obtained when they later produce pneumonia free litters.

Gradually the herd will be rebuilt upon the residual progeny of the non-infected units and within 12 months should be disease free. No pigs should be introduced during this period, but if it is necessary

to introduce new blood lines, the same basic principles can be followed.

It is important to dispose of all infected units—both sows and litters as soon as possible after detection. Following their removal, the premises should be cleaned, disinfected and briefly spelled for several weeks before restocking takes place.

Phase 3.

Following the completion of Phase 2 the potentially free herd undergoes a six months proving period. At appropriate intervals during this time, culls of economic age are selected and killed, their lungs being carefully checked for evidence of pneumonic lesions.

The herd, after safely passing through this final testing period, can confidently be certified as free of virus pneumonia.

Cost.

The main cost would be the necessary erection of double fences in order to secure strict isolation, and a temporary reduction in pig numbers whilst the eradication programme was under way. However, it is considered that the eventual advantages to be gained from increased growth rates and greater efficiency of food conversion are obvious and would far outweigh this initial outlay.

SUMMARY

Virus pneumonia in pigs is so prevalent in W.A. that the time has come when a serious attempt should be made to provide disease free breeding animals. These would provide a source of healthy breeding stock which could in turn be used to repopulate the industry at large.

The availability of virus pneumonia free pigs would provide an even more important sequel in that research workers in swine nutrition and genetics would have an increased opportunity for basic research through the use of a superior experimental animal.

In this light, it is considered that future pig nutrition trials at Muresk Agricultural College may be contemplated with confidence in the results that may be obtained.

MURESK AGRICULTURAL COLLEGE ERADICATION PROGRAMME

The initial step by the college to eradicate infectious pneumonia was taken in August, 1958, when a Tamworth sow farrowed and reared her crossbred litter in isolation. Five of the eight piglets of this litter were killed in November of the same year, and the lungs on examination proved to be free of pneumonic lesions.

The experience gained with this crossbred litter was helpful in determining the steps which were later taken with subsequent pure bred litters.

The number of sows and litters isolated for testing during the latter part of 1958 and early 1959 were few due to the non-availability of suitable isolation paddocks.

To help overcome this problem, work was commenced on seven paddocks separated from the existing piggery by a road and individually isolated by a 12 foot race between. However, progress was further held up by the shortage of suitable pig netting.

With the completion of the seven isolation paddocks, work was started on the reconstruction and redesigning of the layout of the old piggery with the objective of establishing a further 13 paddocks, suitable for rearing, and six larger ones in which to run brood sows.

It is intended that all rearing paddocks will be equipped with round concrete shelter pens to which a concrete creep feed area is attached.

Phase 1.

Due to the fact that there were several top quality sows at Muresk, it was decided, as an expedient, to retain temporarily those sows whose litters proved pneumonia free, so that they could farrow down a second time. Of the four sows retained, only one later produced an infected litter.

Aged sows and those of average quality were disposed of for slaughter immediately following the weaning of their litters.

The actual start of Phase 1 was made with the farrowing of two Tamworth sows in October, 1958, and ended with the testing of the last litter of the original sows in May, 1960.

During this time, 23 litters were farrowed in isolation, and 146 pigs reared to 112 days of age. Of these 146 pigs, 90 (61.6 per cent.) were killed for College rations and their lungs examined for signs of virus pneumonia infection.

Only five of the 23 litters examined showed positive indications of pneumonic

infection, the other 18 litters being quite free.

The residual progeny of the 18 unaffected litters has provided a potential breeding herd of—

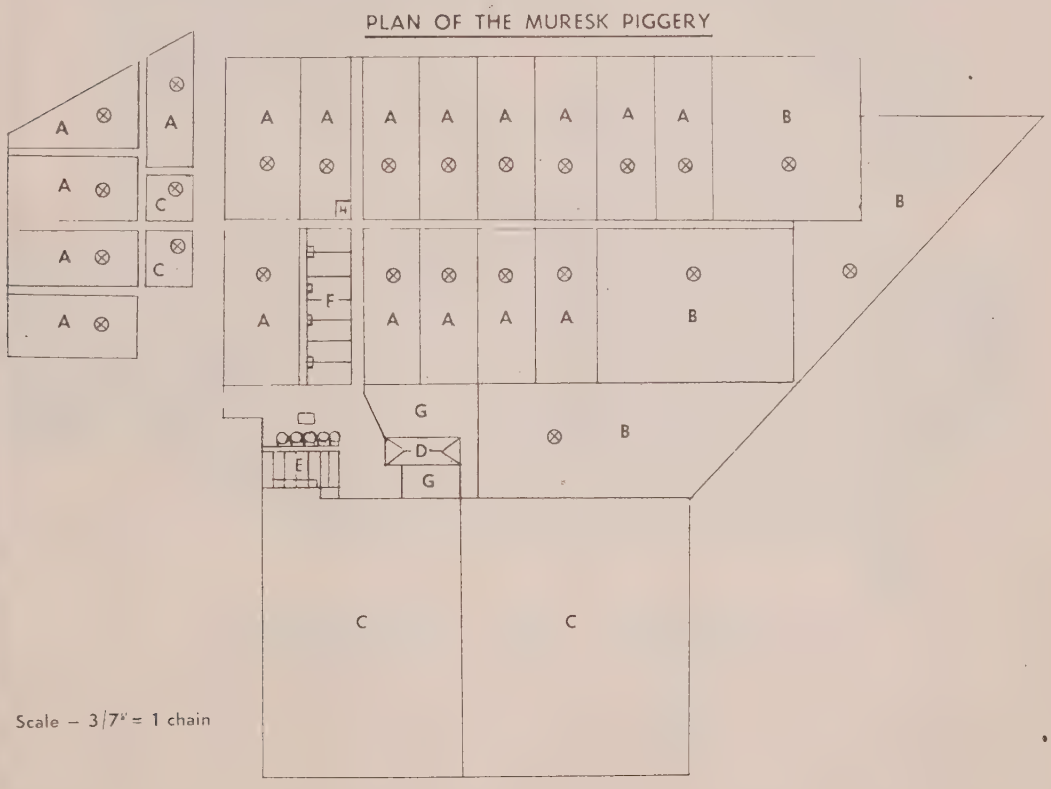
Berkshires:—5 Boars and 24 Sows.

Tamworths:—3 Boars and 8 Sows.

to continue into Phase 2.

In other words there was a variation of 6 lb. (13.9 per cent.) at weaning between infected and non-infected litters and a further variation of 28 lb. (25.9 per cent.) at slaughter between these same groups.

During the early stages of the eradication programme a temporary reduction of pig numbers was inevitable, the numbers



PLAN OF MURESK PIGGERY

A—Rearing paddocks; B—Brood sow paddocks; C—Grazing paddocks; D—Intensive shed; E—Round and sloping floor farrowing pens; F—Boar pens; G—Exercise yards; H—Feed shed; Circle with x inserted—Round shelter sheds.

These numbers are in excess of the normal carrying capacity of the College but will allow for culling at a later date for type and conformation.

The growth variation between free and affected litters is well marked when the average weaning and slaughter weights of the litters tested are compared.

The five infected litters averaged 37 lb. at weaning (56 days) and 80 lb. at slaughter (112 days), whereas the 18 free litters average 43 lb. at weaning (56 days) and 108 lb. at slaughter (112 days).

falling from a peak of 177 in October, 1958, to a low of 69 in March, 1960. The numbers have however since risen and could soon reach 260 should all be retained and prove free of infection.

Phase 2.

During this period the sow will remain in direct contact with her litter until the litter has been tested and certified free of pneumonia.

In this time the sow will only be separated temporarily from her litter at weaning to allow her to dry off and be

mated. This step will provide every opportunity of transmitting the infection, if present, to the progeny.

Phase 2 commenced with the farrowing of two Berkshire sows in March, 1960, and provided all 32 potential breeding sows are tested, this phase will be completed in May, 1961.

During this stage it is also hoped to introduce boars of different blood lines. These boars will be tested for infectious pneumonia by running pneumonia free barrows or cull gilts with them for three to four months and then examining the culls for pneumonic infection at slaughter. This will establish whether the introduced boar is or is not affected with virus pneumonia.

Phase 3.

During the final six months proving period, random selection of culls at fortnightly intervals will be undertaken, the lungs of these pigs undergoing veterinary examination for signs of pneumonic lesions.

Provided the programme of eradication progresses as smoothly as anticipated the Muresk Agricultural College Berkshire and Tamworth studs should be, at the latest, certified as Virus Pneumonia free by October, 1961.

SULPHATE OF AMMONIA

The World's Most Popular Nitrogenous Fertilizer — is **IDEAL** for use "straight," or in well-balanced mixed fertilizers for all crops. It is entirely safe and its continued and increasing use over a long period in Australia, has made

SULPHATE OF AMMONIA

a powerful influence towards MORE PROFITABLE primary production.

SULPHATE OF AMMONIA

is made in Australia, and is distributed by all major fertilizer companies or their agents.

Use "straight" **SULPHATE OF AMMONIA** with confidence, and see that all mixed fertilizers you buy contain adequate nitrogen as **Sulphate of Ammonia.**

KEEP YOUR MONEY IN W.A.

That's what you do when you bank with the "R. & I." . . . Like you, yourself, the "R. & I." *belongs* here and its money *stays* here to help us all. . . . So you see, . . . *where* you bank *does* make a difference. The "R. & I." will welcome your custom!

The R & I *Bank*

W. A.'S OWN BANK

Honey Flora Calendar for February

COMPILED BY R. S. COLEMAN, APICULTURAL SECTION, WITH ASSISTANCE FROM THE BOTANICAL BRANCH

Common Name	Botanical Name	Where Found	Honey		Quality of Pollen	Remarks
			Quality	Quantity		
Blackbutt	*Eucalyptus patens* Benth.	Found in place of Marri in some association. Manjimup-Bindoon	Good	Good	Good	Buds and flowers in the same year. Not enough stands to be really important. Collie, Balingup, best stands.
Powder Bark	*Eucalyptus accedens* W. V. Fitzg.	Occurs on the eastern side of main-heavy rainfall Wandoo area, on the ironstone ridges	Good, first grade	Heavy Medium	Excellent	Powder bark can be differentiated from Wandoo by the powdery bark and from the fact that in early winter the bark has a salmon-colour. Starts to flower at the end of January, and invariably sheds some mature buds just before flowering. This does not seem to lessen the crop of honey. Buds are held for three years, much the same as Wandoo.
Morrel	*E. oleosa* F. Muell. var. *longicornis* F. Muell.	Wheat belt area	Good	Unknown but a few reports have said good	Good	A tall tree on good soil, widely scattered and difficult to find enough trees to work as a flow, could be tried when nothing else available. No information on buds.
Summer White Gum or Wandoo	*E. redunca* Schau. var. *elata* Benth.	South of Wandering and north of Boyup Brook	Excellent	Excellent	Poor	Major honey plant. Three years to form buds.
Karri	*E. diversicolor* F. Muell.	Donnelly Mill, Pemberton, Shannon Mill area	Choice	Heavy	Poor	Karri flowers in this area over 12 months, but the major flow is mid-December, to the end of April. Flowering cycles are apparently tied up with maturing fruit on trees, winter rains to induce growth, and temperate weather in summer when the very small buds are present. Buds from growth of young tips to flower three years.
Marri	*E. calophylla* R.Br.	Enneabba to east of Albany	Excellent	Excellent	Excellent	Major honey plant, very sensitive to climate.
Red Tingle	*E. Jacksonii* Maiden	Southern rain forest. Denmark	Excellent	Excellent	Excellent	Not big enough stands.
Tuart	*E. gomphocephala* D.C.	Moore River-Busselton	Very good	Good	? Poor	Bud eaten by borer. Seldom flowers.

Peaked Crown Mallee	*E. anceps* (R.Br.) Blakely	Mallee area Ravensthorpe-Salmon Gums	Good	Good ?	?	Not enough known.
Mountain Marri	*E. haematoxylon* Maiden	Western slopes of Darling range, south of Pinjarra	Could be good	Good ? ..	Good ? ..	Not enough known.
Sugar Gum	*E. cladocalyx* F. Muell.	Not a native of W.A. but used as a street tree	Good ..	Heavy	Good ..	As this tree is planted extensively in some towns, the local beekeepers get a good crop. Buds believed to be one year old at flowering.
Coastal Blackbutt not to be confused with the Southern Coastal Blackbutt	*E. Todtiana* F. Muell.	Grows in the poor sands of the west coast	Poor	Good	Good	It is an excellent shade tree and under pasture conditions produces freely. Otherwise it is most uncertain; it is believed, but not known, that the buds are two years old when they flower.
Paperbark tea-tree with flat leaf	*Melaleuca parviflora* Lindl.	Swamps and river banks throughout the southern districts	Poor	Good ..	Good	This is a heavy concentrated flow for two weeks from Christmas till mid-January.
Tea Tree	*M. Huegelii* Endl.	Limestone ridges on coast	Good ?	Excellent	Good	Flowers November, December, January. Spike has a purple tip and the plant is usually a shrub.
Rottnest Tea Tree	*M. pubescens* Schau.	Dongara, South Coast, Rottnest, Cape Naturaliste only	Poor	Good	Good	Only four stands known.
Red Bell or Silky-leaved Bloodflower	*Calothamnus sanguineus* Labill.	Widespread, seems to like rocky slopes, either lime or ironstone	Dark, good quality	Excellent	Good	Flowers over a long period.
Silver or Yellow Banksia	*Banksia attenuata* R.Br.	Grows on poor sands along the coast in association with Coastal Blackbutt, and also inland	Poor ..	Good	Good	There is an element of doubt here as good flows reported could have come from other plants.

It will be seen from this list that information concerning many nectar-bearing plants is far from adequate. We would appreciate further information from beekeepers.

Plants — Seeds — Flowers . . .

Railed, Airfreighted or Shipped anywhere

MEMBERS OF INTERFLORA — World Wide Flower Service

COUNTRY CLIENTS travelling to Perth, via Albany Highway. Call at our Nursery Cannington. Leave your order which will be assembled ready for you to collect on your return journey. — NO PARKING WORRIES

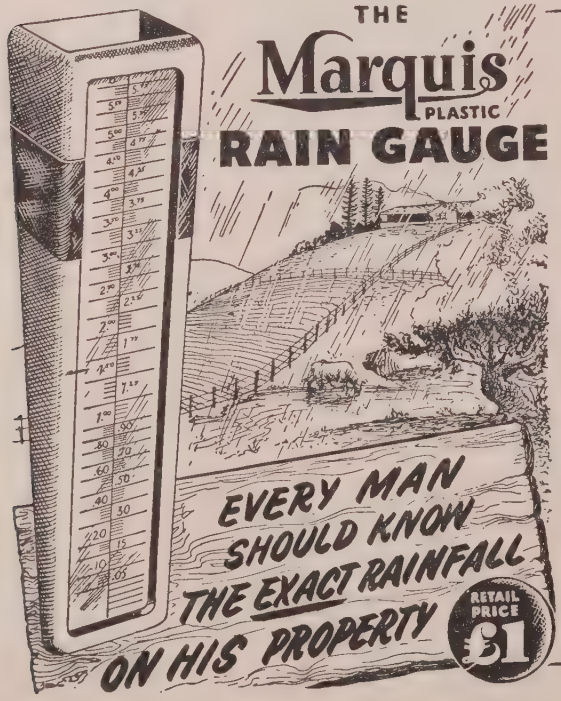
Wilson & Johns PTY. LTD.

Nurserymen, Seedsmen and Florists

HEAD OFFICE AND SALES: 74 Barrack Street, Perth
TELEPHONE: 23 3048 (3 Lines)
TELEGRAPHIC ADDRESS: "WILSONJOHN," Perth
FREMANTLE STORE: 102 High Street, Fremantle
TELEPHONE: 5 2447

NURSERIES: Albany Highway, Cannington
Wilkinson Street, East Fremantle
Phoenix Road, Spearwood

ALL CORRESPONDENCE TO:
74 BARRACK STREET, PERTH



The "Marquis" Plastic Rain Gauge is a precision instrument made from weather-resistant plastic that measures from one point of rainfall to six inches. It can be easily attached to any post or tence (bracket and screws supplied). The "Marquis" Plastic Rain Gauge is available from all leading stores for £1. If unable to purchase from your local storekeeper, mail £1 to Commonwealth Moulding Pty. Ltd., 242 Prince's Highway, Arncliffe, N.S.W., and a "Marquis" Plastic Rain Gauge will be posted free to you by return.

Manufactured by

COMMONWEALTH MOULDING PTY. LTD.

242 Prince's Highway, Arncliffe, N.S.W.

INSECT PESTS

THE HOUSE FLY
(Musca domestica)

By C. F. H. JENKINS, M.A., Government Entomologist

MANY insects are so commonly associated with man and his dwellings that they may almost be called domesticated. In olden days the presence of these insects was accepted as a matter of course, but present knowledge shows that many of them can be important disease carriers while others may cause damage to food and clothing.

There is no more widely known pest or disease carrier than the house fly. Volumes have been written dealing with its habits and control, but it still remains one of the most important problems of the medical entomologist. The name "common house fly" is quite an appropriate one, for the insect is cosmopolitan, and out of a total of 23,087 flies collected in dining-rooms during a census in the United States, 98 per cent. or 22,808 were *Musca domestica*.

There are several local flies which closely resemble the house fly and are often confused with it. The two commonest are the bush fly (*Musca sorbens*), and the stable fly (*Stomoxys calcitrans*). Both are small greyish flies about the size of the house fly, but they seldom come indoors. The species which pesters one when on a country walk and clusters thickly on one's back is not, as popularly believed, the house fly, but the bush fly. The stable fly may be quickly recognised by its stiff piercing mouth parts and its "bite" for again, contrary to the popular idea, the house fly never "bites."

Description of Adult Fly.—The adult house fly measures about a quarter of an inch in length and has transparent wings. The body is greyish and the thorax is characteristically marked with four dark longitudinal stripes. These stripes distinguish the house fly from the bush fly,

The house fly (enlarged)
(After Gibson and Twinn)

for in the latter each pair of dark stripes converge towards the base to form a Y-shaped mark.

Life History.—A single fly may lay from five to twenty batches of eggs, each batch containing from 75-150 eggs. The elongated light-coloured eggs measure about 1-25th of an inch in length and take from eight to 24 hours to hatch under optimum conditions. The small white maggot grows rapidly and passes through a number of instars or stages, each stage being marked by a moulting or shedding of the skin and an increase in size.

When fully grown the maggot passes through an inactive pre-pupal stage, during which no feeding is done and after which it buries itself in the soil to pupate. The larval stage may cover from three to five days in favourable weather and the pupation time an equal period. From the figures quoted it will be evident that the house fly can complete its life cycle in a little over a week. A further period of from seven to fourteen days normally elapses however before a female can lay eggs, so that the interval between successive generations is about three weeks.

How Long do House Flies Live?—It must be clearly understood that the time taken to complete any particular stage may be greatly protracted by cold or other adverse weather conditions. The larval stage, for instance, may extend over a month or more under certain circumstances, consequently an adult fly can emerge in a week or several months from the time of egg laying, according to whether conditions are favourable or otherwise. Furthermore, the adult fly itself may live for a period of weeks or months according to conditions. If these particulars are kept in mind the old question, "Where do the flies go in the winter time?" offers little difficulty. Much of the population dies out if conditions are particularly adverse but a portion survives in various stages of development and is able to bring about a rapid build up of numbers when the opportunity arises.

How Far do They Fly?—Normally house flies do not range very far afield although under certain circumstances they may travel several miles down-wind. One investigation in America involving the release of 54,000 marked house flies showed that 1,216 were re-caught within half of a mile of the release centre, 272 between one and four miles distant, and only four at a distance of eight miles. This and other experiments, coupled with general observations, indicate that when flies are numerous, the breeding source is usually close at hand.

Where do they Breed?—House flies will breed in almost any type of decaying organic material, but they are particularly attracted to all types of animal manures, compost heaps, lawn clippings and kitchen garbage.

Relation to Disease.—The house fly exemplifies one of the simplest types of disease transmission by insects, the role of the fly being merely that of a mechanical carrier. As already stated, flies infest and breed in all manner of refuse such as garbage, damp lawn clipping, human excreta, and various types of manure. Under such circumstances they have every opportunity of coming in contact with disease contaminated material, tiny portions of which may either be swallowed or carried about adhering to the hairs of the legs and body.

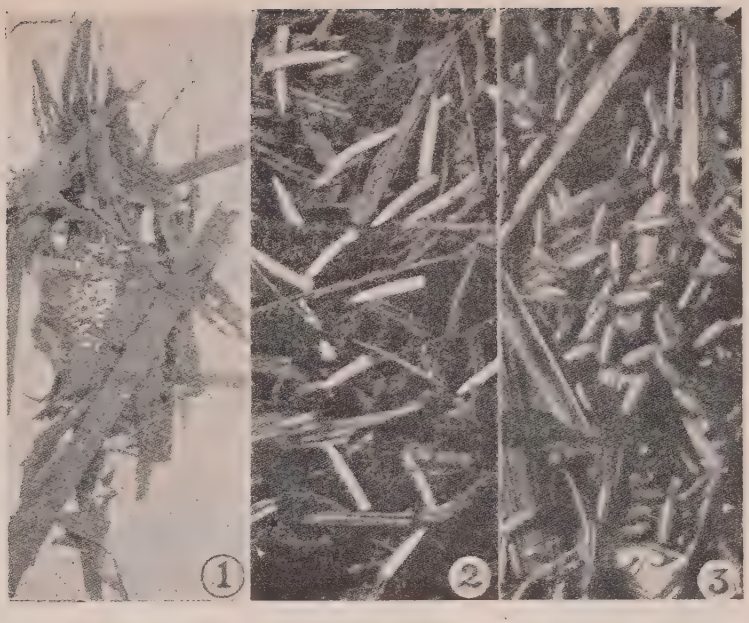
Bearing in mind the house flies' liking for sugar, milk and other foodstuffs, it is not difficult to understand how easily even a single fly can contaminate food and drink by merely settling on them.

The habit of regurgitating a drop of fluid in order to moisten certain foods offers an additional means of contamination since viable bacteria are known to have occurred in "fly specks." In order to emphasise the potentialities of the house fly as a disease carrier, may be quoted the fact that a single insect has been known to carry well over 6,000,000 bacteria.

Amongst the diseases carried by the house fly are typhoid, cholera, various types of dysentery and ophthalmia and tuberculosis. No further propaganda than the above list should be required for an anti-fly campaign, and yet only too often the matter is given but scant attention.

CONTROL

Sanitation.—The first essential for fly control is strict sanitation. This applies not only to the immediate vicinity of dwellings, stables and dairies but to the disposal of garbage, lawn clippings, fowl manure and other organic matter which only too often is piled in some out of the



The house fly. 1—Eggs; 2—Larvae; 3—Pupae (after Gibson and Twinn)

way corner or shovelled into a shallow pit. If garbage is buried it should be treated with an insecticide if already fly struck and covered with at least a foot of compacted soil.

Garbage Tins.—Garbage tins should have close fitting lids and all materials should be wrapped before disposal. Moist waste should not be placed in garbage cans.

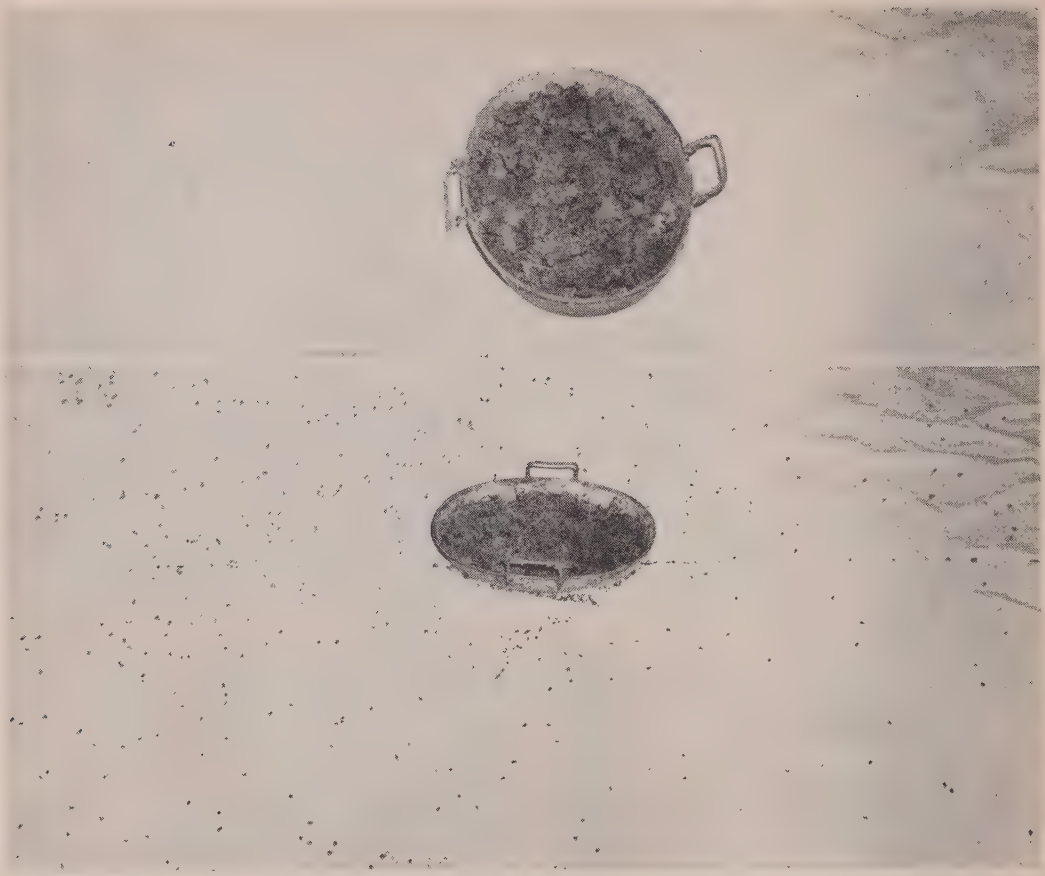
Compost.—It is not generally realised that lawn clippings and various other garden refuse can breed house flies if left in a neglected heap. Where composting is not carried out grass cuttings should be spread out thinly over the garden where they will dry quickly and cause no fly hazard. If a compost pit is used then the clippings should be put immediately into the pit and covered with a layer of soil to keep off flies.

Where fowls are kept, the droppings should be cleaned up daily before fly infestation has occurred and either spread out thinly to dry, or placed in a compost pit with a thin covering of soil. Concrete sided pits or boxes with fly proof covers are satisfactory for composting, but they should be actually fly proof and not just a roughly covered container to which flies have easy access.

Stable Manure.—Manure should be collected and disposed of daily by thin spreading. Where this is not possible, fly breeding may be reduced by tightly packing the material on a concrete base with a 6 in. ditch containing water surrounding the heap. The heat of the pile will prevent the bulk of the manure breeding houseflies and any maggots migrating from the edges of the heap will be drowned. The temporary storing of manure in a concrete or brick bin (preferably covered) will also reduce fly breeding. Where fly maggots are present on the surface of a manure heap, control may be obtained by treating with Diazinon, Pipterex or Dieldrin. An 0.1 per cent. concentration of these mixtures is recommended and one gallon should be sufficient to treat from 30-60 square feet.

Borax has long been used for fly control in stable manure and is still recommended. A solution of 1 lb. of Borax in 6 gallons of water may be used to moisten 30 square feet of manure. Heavy applications of Borax may be detrimental to plant growth and so Borax-treated manure should not be spread on the land at a heavier rate than 15 tons to the acre.

Insecticides.—It should be noted that inseeticide treatments are only a short term approach to house fly control and that lasting results can only be obtained if the necessary attention is also given to



The upper picture shows a dish containing untreated moist fowl droppings placed in a fly-infested fowl run. It was soon harbouring a large number of fly maggots

The lower picture shows the results of treating similar material with 0.5% diazinon. No maggots developed, the manure was covered with dead flies, and the dish was surrounded by flies killed by contact

general hygiene and the disposal of garbage, manure and other fly breeding media. On no account should baits and sprays be used as alternatives to the more fundamental methods of control, as the indiscriminate use of chemicals may finally lead to the development of insecticide resistant flies, and so, to the intensification rather than the relief of the fly problem.

Space Sprays (for Indoor Use).

(i) Pyrethum + synergist = rapid knockdown. No residual action.

(ii) Pyrethum + synergist and residual additive (e.g., DDT, Methoxychlor, lindane) = rapid knockdown plus some residual action.

Baits.

(i) Impregnated mats and Crystal Baits (containing Dipterex, Diazinon, etc.), may be used inside or outside—near resting sites.

(ii) Bait sprays (Dipterex, Diazinon, Malathion, etc.).

These materials are generally used at a 0.1 per cent. concentration with 5-10 per cent. sugar.

Spray on resting sites (eg., walls and concrete floors) where sugar residue is not objectionable. One gallon is sufficient for approximately 500 square feet.

In sheltered conditions these last well, but where exposed to direct sunlight they break down within a few days.

Residual Sprays.

(i) Chlorinated hydrocarbons (e.g., DDT and Dieldrin) may give long lasting results in sheltered situations and are recommended at the following concentrations:

DDT 2 per cent. to 5 per cent.

Dieldrin 0.5 per cent.

(ii) Organic phosphates (e.g., Diazinon, Dipterex, Baytex).

These materials are generally used at concentrations between 0.5 per cent. and 1.0 per cent. In sheltered positions these last well but where exposed to direct sunlight they break down within a few days.

Residual sprays should be applied to resting sites (walls, floors, etc.). One gallon is sufficient for approximately 500 square feet.

Larvicides.

Certain materials (e.g., Diazinon, Dipterex and Dieldrin), have been found effective in controlling maggots in compost and manure heaps, etc.

A 0.1 per cent. concentration of these mixtures is recommended and one gallon should be sufficient to treat from 30 to 60 square feet of surface area.

Borax.

For details see paragraph on Stable Manure.

Screens, Traps, Fly Swats and Fly Papers.—Mesh screens for doors and windows are essential to exclude flies from buildings. Such screens should be carefully fitted and kept in good repair. Screens with 14 meshes to the inch will exclude houseflies, but 16 mesh screens will exclude many smaller insects also.

Fly traps may be useful under certain conditions and should be placed in sheltered situations where the flies are known to congregate.

Sweetened milk, thin treacle syrup or some other similar material makes a very suitable lure for house fly traps. The type of trap may vary, but in the main they are some form of wire cage into which opens a wire cone with a small hole at the apex by which the fly enters, but through which it has difficulty in finding its way out.

Fly swats can be very useful in dealing with the odd, but very annoying fly indoors; fly papers also have their uses, and although somewhat messy should not be scorned entirely. The mixture used in the preparation of the "tangle foot" type of fly paper and fly wires is prepared from the following—

Resin—2 pounds.

Castor Oil—1 pint.

The ingredients are heated togther to the consistency of honey and then smeared on paper or wires to be hung from the roof or placed in other suitable places.

Resistance to Insecticides.—The ability of many insects and particularly house flies to develop resistance to various types of chemicals poses one of the most serious problems in pest control. The ability to resist certain pesticides is due to the inherent or genetic constitution of the flies and the fact that in a population a few flies may survive chemical treatments. The progeny from these "tough" flies soon outnumber the normal insects and the more intensive the spraying campaigns, the more rapidly are the resistant strains selected.

Resistance to one insecticide frequently implies resistance to other allied chemicals so that when flies become resistant to DDT for instance, they also become less susceptible to Dieldrin and other chlorinated hydrocarbons. Diazinon, Malathion and other organic phosphates can then be used, but resistance to these materials has also occurred in some countries. Unfortunately, once flies have become resistant to any chemical they retain this characteristic for a long time.

Even if DDT spraying is suspended for several years it has been found that resistance will appear rapidly after its re-inclusion in the spray programme. Although insecticide resistance is a real factor in fly control it should not be used as an alibi for inefficient methods.

Spray treatments where necessary, should be applied carefully and in accordance with recommendations, but if in any area resistance to a particular group of insecticides is proven, as for instance to DDT and Dieldrin (chlorinated hydrocarbons), then materials such as Malathion, and Diazinon (organic phosphates) should be substituted.

for all farm animals

for feet—

★ **TERRAMYCIN OINTMENT**

for footrot and wounds

Proved effective. More economical than tinctures, costing only a few pence per application, Terramycin Ointment, with Polymyxin B Sulphate, effectively halts the progress of the disease. Unspillable, easily carried and simply applied, Terramycin Ointment (Veterinary) is the ideal treatment for footrot in sheep.

Terramycin*

BRAND OF OXYTETRACYCLINE

*Trademark of Chas. Ffizer & Co., Inc.

for eyes—

★ **TERRAMYCIN OPHTHALMIC OINTMENT**

★ **TERRAMYCIN EYE PELLETS**

for pink eye and other eye infections

The value of the Terramycin-Polymyxin combination in the treatment of eye infections is widely recognised. The broad-spectrum antibacterial effect of TERRAMYCIN is fortified by the presence of Polymyxin, which is especially effective against those organisms which are often the cause of persistent infection of the eye. This combination is the logical choice of owners called on to treat infections such as pink eye and blight in cattle and sheep.

Pfizer

PFIZER CORPORATION

P.O. Box 57, West Ryde, N.S.W.

PF78.86

Let's Look at Dairying

By M. CULLITY, B.Sc. (Agric.), Superintendent of Dairying

FOR several years there has been a lot of gloomy forebodings about the future of the dairying industry. It has been said that there is a drift from dairying; the industry is declining; or even that it is finished.

Despite these forecasts the industry continues to make progress and as those who are closely associated with it are aware, dairy farmers are gradually overcoming a major disability in the relatively small amount of development of many farms. This is gradually bringing farms to an economic standard and therefore will render them more stable. In other words, what has happened is quite different from what was suggested. The gloomy opinions have not been realised, instead there has been increased production at a higher level of efficiency.

I will not bore you with figures but will endeavour to use those which are necessary to illustrate some trends and to show you that dairying is not finished; it is not declining. On the other hand there is an evolutionary progress or constant change which with rising production is in the direction of greater efficiency.

Milk is one of nature's protective foods which is of special value to the very young and to the very aged. It is good for all because of its high protein quality, its vitamins and its minerals.

Butter and cheese also are regular articles of diet. There have been fears expressed for the future of butter because of the threats of substitutes but the total effect so far is small and the future effect is thought not to be serious. There is no suggestion of a declining usage of cheese which rivals meat as a source of protein. On the other hand there appears to be a growing awareness of its value.

So while these foods are so valuable and there is a continuing if not increasing recognition of their value, the steady demand for them must encourage continued production.

In addition the population of Western Australia has risen and is expected to continue to rise. More mouths to feed means more food, more dairy produce will be needed, but it is hardly fair to argue that the industry is safe solely because we think people will continue to need its products. Let us look at what has happened in the industry itself to make it more secure.

Prior to 1939 there was a substantial portion of the dairy cattle of Western Australia located outside of what are considered the dairying districts of the South-West. Many were located in various parts of the wheat belt and the great southern

districts. Early in the War however, the shortage of refrigerated shipping space led to the prohibition of export of second and pastry grade butters. The result was that in order to meet the problem caused by an accumulation of this quality, an extremely low price was paid for inferior cream. Much of that produced in the latter districts was poor and the lower prices removed the incentive to continue milking.

There followed a gradual decline in the number of dairy cattle; this was counter balanced by a corresponding increase in numbers in the dairying districts. The total number in the State did not decline but the geographic disposition was changed.

Because of the more favourable climatic conditions for the growth of pastures and a relatively longer grazing season this has meant a bigger percentage of cows are milked under conditions more conducive to high yields.

At the same time there has been a voluntary withdrawal by some of the smaller farmers who may not have been technically inefficient but because of the relatively small size of their enterprises were unable to achieve a reasonable income.

There also has been a progressive development of farms to larger areas of pasture and so increased carrying capacity. It is not possible to procure figures relating to all farms to show the trend, but data from herd recording seems sufficiently satisfactory to show what has happened.

In 1941-42 the average herd size was 24, in 1959-60 it was 40.

Although figures for the total production for the State for the year ending June 30 last are not available there is a possibility of its having been an all-time record. Fewer dairy farmers are producing more milk than ever before in the history of this State.

It is possible to suggest reasons for this development. As pointed out above, there are fewer herds—they are larger, and the average yield has risen. In herds under herd recording it has moved from 181 lb. of butterfat in 1956-57 to 244 lb. in the past year. In terms of milk it has increased from 496 to 577 gallons.

How has this been done? There could have been no spectacular improvement in the genetic constitution of the herds. It is obvious there has been better management—the cows have been better fed; but many other aspects of management have had their influence in giving this result.

Herd recording data shows that more cows are being kept in production for a full lactation, e.g., 7 years ago 24 per cent. of the cows completed a 9 months lactation. In 1959-60, 40 per cent. or nearly double the number were in milk for 9 months or longer. In 1955-56 only 3.6 per cent. of the cows completed a 10 month period whereas in 1959-60, 21 per cent. were in production for this time. This is reflected also in the average length of lactation in all districts. Seven years ago the average length of lactation was less than 7 months. Last year it was over 7½ months.

Many farmers are using herd recording data to greater effect. Those who keep their herds under test continuously year by year are obtaining better results than those who submit their herds intermittently. This really is the answer to the question "Does herd recording Pay?" A lot of money has been spent in testing herds. Money that has been provided by the State and Commonwealth Governments as well as by the farmer himself. There is no doubt that in many herds a good deal has been spent uselessly but the evidence of recent years shows clearly that those farmers who are really interested have been able to use the data successfully to get higher yields. A sliding scale of fees with a progressive reduction according to the length of time a herd is under test is an encouragement to those farmers who take this interest and it is reducing the number of those who submit their herds for one or two years and then withdraw. The opinion could be expressed that this is very largely responsible for the fact that last year over 60 per cent. of the herds in herd recording had been under test for four years or more.

However, much of the data procured from the records is of value to all dairy farmers as it relates to management rather than to the individual cow. For example, the information that higher yields on an average are obtained from those cows which calve in the months of March to June is of value to all.

So we see that on the farm greater efficiency and production is being achieved.

There has also been a considerable improvement in the treatment of dairy produce in factories and for the city milk market. The milk distributed to the people in the metropolitan area is produced under controlled conditions from disease free herds. It is chilled at country depots before transport to the city where it is pasteurised prior to distribution.

There has been a substantial improvement in the quality of butter resulting in not more than 1 per cent. being less than a good table quality.

The attractiveness of cheese is also increasing. There has been a revolution in packaging it. This is proving a protection of the Western Australian market for the local product. The rindless package prevents waste by the absence of a surface rind and therefore it is much more attractive to the housewife.

So we see that dairying in Western Australia is actually strengthening. It has become more stable, it is capitalising on the assistance given by the Government in various ways. The Dairy Farm Improvement Scheme is helping some farmers to increase the productivity of their farms. The activities of the Western Australian Department of Agriculture are designed to give assistance to farmers and to the managers and staffs of dairy produce factories.

There is little doubt that despite the early gloomy comments to which I have referred and despite the very great difficulties with which it has been faced, the dairying industry is gradually becoming one of Western Australia's great industries.

"LIGHT BROWN APPLE MOTH"

By C. F. H. JENKINS, M.A., Government Entomologist

DAMAGE by the Light Brown Apple Moth, was reported to be quite serious in some districts last season and many orchardists are quite concerned at the increase in this pest over the last few years.

The Light Brown Apple Moth is a native insect, which has caused some damage to local fruit for very many years but there seems to have been a definite upsurge of the pest in the last four or five seasons, particularly at Manjimup and, to a lesser extent, at Bridgetown. The adult moth is seldom seen, but measures about $\frac{3}{8}$ inch in length, and is torpedo-shaped, with yellowish-brown wings. Prior to these recent infestations Apple Moth damage was more of a curiosity than anything else, and consequently, the insect has received little detailed investigation in this State. In the East, on the other hand, the insect or a very close relative, has long been troublesome and has therefore, been studied in some detail.

Each female lays about 200 eggs, which are flat and greenish in colour, and consequently rather difficult to see. On hatching, the tiny caterpillars feed on the underside of the foliage until nearly full grown, when they may web two leaves together or tunnel into one which is partly curled. Damage to the apple is superficial and may vary from a few surface pits to very extensive subsurface tunnelling. The injury is frequently at the stalk end, and often commences where two apples are touching, or when the fruit is protected by a leaf.

This type of injury is, of course, very distinct from the deep boring of the Codling Moth caterpillar, which usually makes for the centre of the apple and destroys the pips.

The relatively sudden build up of the Light Brown Apple Moth is not easy to explain, but it may be associated with the increased use of DDT as an orchard spray. When DDT supplanted arsenate of lead, as the routine Codling Moth treatment in Eastern Australian orchards, it soon became apparent that the Apple Moth was getting out of hand, and separate treatments for the pest became necessary. Local orchardists use much less DDT than their Eastern States counterparts, but it is apparently just enough to upset the earlier balance which kept the moth in check.

The name Apple Moth as applied to this insect highlights the fact that the apples are the main economic crop damaged by the pest, but it has a wide host range, including many native and cultivated plants. Cover crops of various kinds can harbour the creatures and may often add to the difficulty of control.

Fortunately, several of the newer insecticides have shown promise against the caterpillars of the Light Brown Apple Moth, and are quite useful against various other apple pests. While DDT, Dieldrin and several other chlorinated hydrocarbons still have a very real place in the orchard spraying programme their use should be reduced to a minimum where fruit tree mites or Apple Moth are troublesome.

Strangely enough, a close relative of DDT, and known by the letters TDE, or DDD is very useful against the Light Brown Apple Moth, and has been used with good effect both locally and in the East. It should be applied in the early summer at the rate of 2 pints of 20 per cent. emulsion to 100 gallons of water. Two quite recent insecticides have also shown great promise at the same concentration, and these are Gusathion and Sevin. Both Gusathion and Sevin have gained favour in those parts of the Eastern States where DDT resistant Codling Moths have multiplied but they have also dealt effectively with several other caterpillars including those of the Apple Moth.

Formulae recommended for these two materials are as follows—

(1) Gusathion 25 per cent. wettable powder—2 lb.
Superior summer spraying oil—1 gallon.
Water—100 gallons.

(2) Sevin 50 per cent. wettable powder—2 lb.
Superior summer spraying oil—1 gallon.
Water—100 gallons.

Either of these sprays should be useful in late October or early November for the looper caterpillars and many other spring pests but further sprays in early December and perhaps again in January may be necessary if Light Brown Apple Moth caterpillars are numerous.

THE USE OF SEAWEED AS A FERTILISER

By T. WACHTEL, B.A. B.Sc. (Agric.), Horticultural Adviser.

MANY enquiries and reports have been received concerning the use of seaweed as a garden fertiliser. Some home gardeners, who use seaweed regularly, report very spectacular results, and some even go as far as to attribute some magic properties to this material.

It is quite natural that with the increasing difficulty and cost of obtaining sufficient quantities of stable manure, gardeners look around in search of suitable substitutes, and those who have a ready access to seaweed are anxious to know what success could be expected from its use.

A review of the literature shows that seaweed is used successfully in many parts of the world in the immediate vicinity of the coast. It is used extensively in the Channel Islands, the coastal soils of England, Ireland and France, and many parts of America.

In assessing the value of seaweed in gardening we must make distinction between its value as a source of plant nutrients and as a source of organic matter or "humus."

The material available for collection from the ocean beaches in this State is very poor in plant nutrients. Unfortunately, most of the so-called "seaweeds" of the Western Australian coast are not true seaweeds, which belong to a rather primitive group of plants called algae, but are more highly developed plants, and may more properly be called sea grasses. These local sea grasses are very high in ash, over 50 per cent. of the total dry weight being

generally of ash material, the chief constituent of which is calcium carbonate. They are low in nitrogen, phosphate and potash. By way of comparison, cow manure contains four times as much nitrogen and up to ten times as much phosphorus and potassium.

River algae, on the other hand, have quite appreciable manurial value. They contain about 85 per cent. moisture when first collected, and 12 per cent. when dried in the open air. A local sample analysed showed 3 per cent. nitrogen, 1.6 per cent. phosphoric acid and 2.3 per cent. potash present in the air dried material. While this analysis is still not very high, it compares favourably with most animal manures. The high total salt content—about 9 per cent. in the sample analysed—usually presents no problem in sand where normal watering would wash it out quickly. The high iodine content of seaweeds has no advantage for plant life as iodine is not an essential plant food. On the other hand, the high amount of calcium which is invariably present in seaweeds would make them a very effective liming material for acid soils.

However, the main value of seaweed lies in its large bulk of organic matter, with which it can build up light sandy soils. It increases the moisture holding capacity of these soils, as well as their capacity of retaining artificial fertilisers applied later. It also has the advantage of being free from weed seeds which are often abundant in animal manures.

The water content of seaweeds or sea grasses collected on the beach is approximately 75 per cent., which means that handling and carting will be expensive. Air drying would reduce manyfold the weight to be transported. Pulverising would greatly improve the ease of distribution and incorporation into the soil, but it is normally not carried out as extra costs usually exceed any benefit that may result.

When the material on the local ocean beaches is being used, it has to be collected within a few days of being washed up on the beach, as true seaweeds, being very soft, would decompose rapidly, especially when partially covered with sand, leaving behind the coarse and less valuable sea grasses. Decomposition appears to be more rapid in summer time, hence the best time to collect the material would be late winter or early spring.

The best way to prepare seaweeds and sea grasses for the garden is to put them in a compost heap for about six months. As the fertiliser value is very low, it is recommended to add 20-50 lb. of superphosphate and about the same amount of ammonium sulphate to each ton of fresh material in the compost heap or compost pit. For composting, seaweeds can be mixed with animal manures and any vegetable matter commonly used for composting. It is essential to keep the compost heap moist until late autumn or early winter, when it should be applied to the soil and then dug or ploughed in. Relatively heavy dressings should be given. To be of any benefit, at least 10, and anything up to 50 tons to the acre should be used and completely buried in the soil.

As an alternative, the ground could be trenched and the fresh seaweed be placed in the bottom of the trenches, where, in the course of time, if it has been kept sufficiently moist, it will decompose and become incorporated with the soil.

Another alternative is to use the seaweed as a surface mulch and dig it in later when the crop is finished. It is usual to apply a surface layer about three inches deep. Like any other organic surface mulch, this too would attract insects and provide a breeding ground for flies. However, if these insects become a serious problem, they could be controlled by the appropriate insecticides.

It appears that in the absence of organic manures, seaweeds can provide a suitable substitute when properly treated. The moisture holding capacity of these materials is sufficient to warrant their use as a substitute for stable manure where transport does not render the cost prohibitive. They can be used to build up sandy soils along our coast where transport is short and heavy applications can be used. However, it is well to remember that the main function of these materials is to increase the water holding capacity of light sandy soils and not primarily to supply fertiliser ingredients, or even to replace artificial fertilisers. It will still be necessary to apply the usual dressings of chemical fertilisers in the garden for best results.

No. 83.—Many-flowered mallee.
(Eucalyptus Cooperiana F. Muell.)

A—Branchlets with leaves and flower buds; B—Flower buds (enlarged); C—Flower bud in section (enlarged). D—Anther (much enlarged—between Esperance Bay and Eyre—*Hammond);* E—Flower buds—near Mount Boyatup, *Gardner* 12907; F—Flower buds. G—Fruits; H—Section of fruit—Thomas River, *Gardner* 12942.

TREES of Western Australia

By C. A. GARDNER

No. 83—THE MANY-FLOWERED MALLEE

(*Eucalyptus Cooperiana* F. Muell.)

THIS species was described by Mueller in February, 1880, from a fragment with buds and flowers without fruits, collected by George Maxwell in South-Western Australia, without any locality. It remained imperfectly known until a few years ago when a specimen was collected, again without precise locality, but somewhere between Esperance and Eyre, by Hammond. This specimen was in bud only. On the 21st October, 1960, the writer found a strange mallee near Boyatup Hill to the north of Cape Arid which proved to be this species, collected this time in bud, but with fruits.

The plant is of striking appearance by reason of its white smooth bark densely branched habit, and deep green lustrous leaves, and in its purple, acutely angled branchlets. The dark purple-brown hypanthium is surmounted by a pale yellow short and obtuse operculum which at this stage is broader than the hypanthium, and the buds are mainly 8-10 in the umbel. A characteristic is the broadening of the individual flower-stalk under the hypanthium. This mallee was found to be fairly common from the region of Boyatup to beyond Mount Baring, and extended in a north easterly direction nearly to Mount Ragged, but was most common in the southern area of its range. Growing on open heath country it possessed a striking appearance and was the largest shrub occurring there.

On the following day whilst travelling down the lower course of the Thomas River a still finer group of specimens of a related plant of striking appearance was found growing in the low-lying country close to the river. This was a tall mallee or tree of up to 15 feet in height with a pinkish- or yellowish-white smooth bark, erect and densely leafy branches, and with a profusion of pale yellow flower-buds, differing from the Boyatup specimens in the still broader leaves, much larger flower buds and fruits, the former with ribbed and obtusely pointed opercula, and larger irregularly ribbed fruits. It may prove to be a distinct variety. The fruits are almost half an inch in length. Both plants had the characteristic purple angled branchlets, and seven or more flowers to the umbel. The species is an unusually attractive one, and interesting because of the variation in its buds and fruits.

When describing the species, Mueller compared it with a mallee from the Stirling Range (*E. decurva*), but its closest affinity is undoubtedly *Eucalyptus Flocktoniae,* the Merrit, a handsome tree of the Eastern Goldfields, but possessing a mallee form near the south coast.

Eucalyptus Flocktoniae, belongs to the *oleosa* group, species remarkable for their oil yields, but in *E. Cooperiana* I cannot find any trace of oil cavities or dots in the leaves. Furthermore, *E. oleosa* and *E. Flocktoniae* have long slender awl-like protruding points at the apices of their valves, while in *E. Cooperiana* the valves are deeply included without such points. The anthers of all are much alike, but the anastomosing ribs of the fruits of *E. Cooperiana* are distinctive. Mueller in describing *E. Cooperiana* states that he has

No. 84.—Yate (*Eucalyptus cornuta* Labill.).

A Leaves; B Umbel of flower buds; C—Flower bud (enlarged); D—Anthers; E—Flowers; F—Cluster of fruits; G—Fruit (enlarged); H—Fruit in longitudinal section. Ross Peak, *Gardner sine no.*

not seen the fruit, but Blakely (Key to the Eucalypts) describes these, apparently those of *E. oleosa,* and also gives King George's Sound as the locality for the species. It is quite evident that Maxwell collected his specimen on his journey from Cape Arid to the Great Australian Bight.

Eucalyptus Cooperiana commemorates the name of Ellwood Cooper of Santa Barbara College and the author of "Forest Culture and Eucalyptus trees." He was a promotor of the cultivation of Eucalyptus in California. The species is worthy of cultivation being both attractive in appearance and suitable for shade purposes.

No. 84—THE YATE

(*Eucalyptus cornuta* Labill.)

WELL known for the qualities of its timber, notably strength, elasticity and density, the Yate was formerly prized for coach work, being used for wheel spokes and the shafts of horse-drawn vehicles.

It was named by Labillardiere in 1799, from the original (Type) specimen which he collected in the Recherche Archipelago between the 13th and 20th December in 1792. The precise locality was probably Middle Island. My reason for stating this is because one so frequently reads of Labillardiere collecting in the vicinity of King George's Sound, whereas the Expedition of D'Entrecasteaux sailed along the southern coast towards the end of 1792 without landing until Esperance Bay was reached on the 13th December. In this connection it is interesting to surmise just how Labillardiere came to describe the pitcher plant (*Cephalotus follicularis*) which he is credited with having collected, but which he could not possibly have seen in a living state since it does not extend further eastwards than Two People Bay close to King George's Sound. The Yate therefore is the first Western Australian species of Eucalyptus to be described and named.

Eucalyptus cornuta is the true Yate. The flat-topped, or swamp Yate is *E. occidentalis;* the warted Yate is *E. megacornuta,* and the salt-river Yate is *Eucalyptus Sargentii,* related, but quite distinct from the true Yate. The species is endemic in South Western Australia, extending from the Vasse River to the Dalyup and perhaps still further to the east. Inland it extends to the upper reaches of the Fitzgerald River, and the Stirling Range. Almost always associated with granite rocks, it is found growing in the Stirling Range in soils of a different origin. The main centre of its distribution is between the Frankland River and Mount Barker, and southwards to King George's Sound. The characteristics of the tree are its rough dark grey somewhat shaggy bark on the trunk and main branches, the pale yellowish-brown extremely hard and tough timber, and its long operculum and yellow filaments. Still more characteristic is the fruit with its exserted domed disc and long valves formed from the base of the style (see illustration.)

Eucalyptus cornuta derives its name from the horn-shaped operculum. The tree is both decorative and of rapid growth. It has been stated that it grows remarkably quickly in tropical countries, and in India it has been recorded as having grown 8-10 feet in the first year. It flowers from November to February, and is valued by the beekeeper for its production of pollen and nectar, the latter yielding an excellent honey.

No. 85—THE GREY GUM

(*Eucalyptus Griffithsii* Maiden.)

ALTHOUGH occurring as a tree, this species, especially in the Coolgardie and Bullabulling area, where it is common, is more typically a mallee up to 18 feet tall with a reddish bark in the upper parts. The tree form is more typical of saline areas, and is relatively abundant on the shores of Lake Lefroy around Widgiemooltha, where it occurs as a tree with a rough fibrous light grey persistent bark and smooth branches.

The tree attains a height of between 40 and 45 feet, the trunk being up to 10 or 12 inches in diameter, and the timber is brown with an interlocked grain. The tree typically has a crooked trunk, and

No. 85.—Grey Gum (*Eucalyptus Griffithsii* Maiden.)

A—Branchlets with leaves and flower buds; B—Anthers. C—Branchlet with fruits; D—Fruit in longitudinal section (much enlarged). Bullabulling, *Gardner 9269*.

No. 86.—*Eucalyptus Albida* Maiden et Blakely.

A—Branchlet with leaves and flower buds; B—Anther; C—Branchlet with young fruits; D—Primary foliage
A—Harrismith, *Gardner* 2113 (Type); C—Dudinin, *Gardner sine no.*

is not very attractive, whilst the mallee form, with its handsome glossy foliage is worthy of cultivation in dry areas. Characteristics of the species are the flowers which are always in umbels of three, the three flowers being in the one plane, long peduncles which are erect, and rather long pedicels (individual flower-stalks) which are dilated upwards into the hypanthium. The hypanthium is two-angled, and this condition is also to be observed in the fruiting stage, with often a few intermediate but less prominent angles. The operculum is depressed-hemispherical or cushion-shaped, and ribbed with broad obtuse ribs or corrugations. The filaments are white, and inflected in the bud stage. A comparison should be made with *E. Le Souefii* and *E. corrugata*, recently dealt with in this series. The obvious differences are the three flowers of *E. Griffithsii*, the absence of numerous ribs to the hypanthium, and the pedicel broadening upwards into the hypanthium.

Eucalyptus Griffithsii has an area of distribution extending from Coolgardie and Bullabulling southwards to Widgiemooltha. The name commemorates J. M. Griffiths of Melbourne who collected the original (type) specimen at Kalgoorlie.

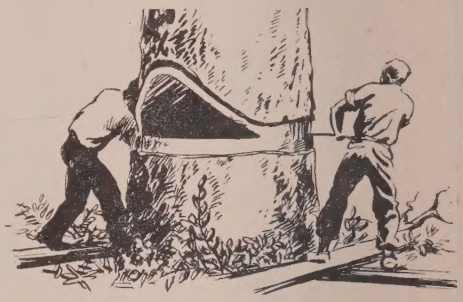
No. 86

(*Eucalyptus albida* Maiden and Blakely.)

THIS species is always a mallee, rarely exceeding 10 feet in height, it has a range extending from the Tammin sand plain in the north to the gravelly-sandy sand heaths of the Dudinin and Harrismith districts.

The original (type) specimen was collected by the writer at Harrismith on the 6th March, 1924, the shrubs being 3-5 feet tall and remarkable for the two types of foliage present, both of which are here illustrated: the narrow deep green lustrous leaves of the upper older branches, and the broad frosty-white opposite leaves of the younger lower branches. These represent the primary foliage which is seen on a number of Eucalyptus species, especially the blue gum, and a number of tropical species, especially the bloodwoods. It is frequently, but inaptly, often called "juvenile" foliage.

Eucalyptus albida is very closely related to *E. foecunda*, recently dealt with in this series, differing principally in the distinctly longer pedicels, the obtuse operculum, and the campanulate shape of the fruit. The anthers of the two species are identical.



DAY OLD CHICKS

Australorp, White Leghorn, Rhode Island Red, New Hampshire, First Cross, Kriss Kross

Unsexed and Pullets

6-8 WEEKS OLD PULLETS

Hatchery:

EPSOM AND SMITH AVENUES, REDCLIFFE **Phone 6 5543**

All Stock Proved by Trapnesting from

WEXHAM POULTRY STUD AT BERKSHIRE RD., FORRESTFIELD

Inspection Invited